Process Evaluation of the Svendborgproject

Exploring Factors for Successful Implementation of a School Based Physical Activity Programme

PhD thesis
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Odense, 2018

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Preface and acknowledgements

The work presented in the thesis was carried out between December 2014 and June 2018 at the Faculty of Health Science, University of Southern Denmark and made possible by funding from the TRYG Foundation and the Center for Human Movement and Learning, University College Lillebaelt and University of Southern Denmark. However, the fundamental question that has driven my work these last years were developed before I even knew that I was going to write an PhD.

> *"Upon this first, and in one sense this sole, rule of reason, that in order to learn you must desire to learn, and in so desiring not be satisfied with what you already incline to think..."* — Charles Sanders Peirce

In the final period of taking my master in public health I had obtained basic knowledge on how to structure and facilitate prevention and health promoting programmes. I was ready to put this knowledge into action by initiating research-based health programmes in the 'real-world'. However, doing my master thesis made me realize a major gap in my perception of health programmes and that it might not be a simple matter to 'put knowledge into action'. My master thesis included a documentation of Danish municipality programmes promoting weight loss in overweight or obese children. When analysing the 75 programmes that were identified, only few were evaluated and very few had been sustained in the municipality setting, even though some were deemed effective. The lack of evaluations and sustainability was puzzling to me as these programmes all had potential information on barriers and facilitator when planning, implementation and sustaining programmes in the real-world – valuable knowledge that could be useful when initiating and facilitating similar programmes in practice. Thus, I slowly realized that I was not satisfied with what I inclined to know. I found myself desiring to learn, driven by the question on how 'real-world' programmes can become successfully implemented and maintained in real-world practice – and most importantly how I could learn from others experiences in

the development and planning of future programmes. Slowly I drifted towards a new field – Implementation science.

Even though I was driven by a curiosity towards implementation science, the thesis could not have been possible if it was not for my two supervisors' Thomas Skovgaard and Heidi Klakk. Thank you for putting your trust in me and given me the chance to work on this programme. Heidi, you ensured that we were welcomed when we moved to this new city, you invited us into your home and took the time to show us Odense. Thomas, you are in many ways an inspiration always cheerful and full of energy, I have enjoyed working with you and learned a lot. Also, a great thanks to Thomas Bredahl, you became part of the process at a late time, still you dedicated yourself and I have highly appreciated your support.

During my thesis I have also been blessed with good colleagues in both the research units for Research in Childhood Health, Research and Innovation Centre for Human Movement and Learning, and Active living. Thank you for your academic insights and discussions as well as making it a delight to go to work.

I would also like to thank the participating programme managers, school heads and physical education teachers for their valuable time and willingness to reflect on the various aspects of the Svendborgproject and their work on implementing the programme. Without your contributions, this thesis could not have been realised.

Lastly, I would like to thank my beloved family without you none of this would have mattered. You have always been the most important part of my life and my highest priority. Pans, when I was offered my position as a PhD fellow you left your friends and family without hesitation. I thank you for having the courage to move to a new unfamiliar city as well as your proactivity and stamina while building a new life here in Odense. Berto, you are the most marvellous boy and I enjoy every minute I spend with you, watching you grow and learn is the most wonderful experience. Isen, thank you for the 'support' during

the last two weeks of writing my thesis, having you sleeping on my belly while finishing the PhD ensured that I appreciated every minute of it.

Jonas Vestergaard Nielsen

Odense, June 2018

List of papers

I. Nielsen J.V., Klakk H., Bugge A., Andreasen M.L. and Skovgaard T., *Implementation of triple the time spent on physical education in pre-school to 6th grade: a qualitative study from the programme managers' perspective.* Evaluation and program planning 2018. Accepted and in press.

II. Nielsen, J.V., Skovgaard, T., Bredahl, T.V.G., Bugge, A., Wedderkopp, N., & Klakk, H. *Using the RE-AIM framework to evaluate a school-based municipal programme tripling time spent on PE*. Evaluation and program planning 2018, 70, 1-11. Published.

III. Nielsen J.V., Bredahl T.V.G., Bugge A., Klakk H., Skovgaard T. *Implementation of a 10-year intervention that tripled the time spent in physical education: exploring provider and programme characteristics.* Evaluation and program planning. Accepted and in press.

English abstract

Background:

Implementing real-world programmes is a complex matter and there is an ongoing need for effective strategies to promote dissemination and translation of promising physical activity programmes into a school context. This emphasises the relevance of investigating real-world programmes such as the Svendborgproject – a comprehensive intervention programme tripling the amount of physical education (PE) in primary schools in the municipality of Svendborg, Denmark. The programme has shown the ability both to be effective in relation to health outcomes and to be maintained for a period of ten years. Despite the documentation of effectiveness, the implementation process has not been studied. Thus, the aim was to identify important factors that have influenced the successful implementation process of the Svendborgproject.

Methodology:

Pragmatism constituted the scientific theoretical foundation of the thesis with strict abduction set as the main mode of reasoning. An embedded mixed method design was used applying four different methods; i) semi-structured interviews, ii) highly-structured interviews, iii) questionnaires and iiii) document analysis. The semi-structured interviews have been the dominant method in the thesis. Thus, the rest of the methods applied were embedded into this method to establish a broader, deeper and more comprehensive understanding of the implementation of the Svendborgproject. Insights on the implementation process were collected from programme manager, school head and PE teacher.

Results:

Four main factors influencing the successful implementation were identified; i) programme being in alignment with existing school values and priorities, ii) programme managers combining a top-down and bottom-up approach, iii) PE teachers participating in a professional development course iiii) enabling adaptability of the programme to the individual school context.

Conclusion:

Programme managers and school providers found the Svendborgproject of high value and manageable within an already packed school curriculum. The implementation and maintenance of the programme was stimulated by the combination of a bottom-up mentality leading to early involvement of schools and a top-down approach through core requirements to be implemented. Adaptation to individual school context empowered localized decision-making and supported both operational capacity to install the programme and adaptive capacity to underpin continuous programme innovation. The linkage to research secured central political support that consolidated programme funding, ultimately allowing the possibility of programme adaptation, programme maintenance, and possible scale-up. Lastly, a professional development course supported PE teacher capabilities and motivation for implementing the programme with high fidelity.

Danish abstract

Baggrund:

Implementering af nye tiltag i praksis er en kompleks proces. Derfor er der behov for vidensdeling om effektive strategier til implementering af skolebaserede tiltag, der har opnået at implementere fysisk aktivitet med succesfulde effektmål. Dette understreger betydningen af at undersøge initiativer som Svendborgprojektet - et omfattende interventionsprogram, der har tredoblet mængden af idræt i folkeskolen i Svendborg Kommune. Projektet har vist sig effektiv i forhold til at forebygge livsstilssygdomme og er blevet opretholdt i en periode på ti år. På trods af dokumentationen af de sundhedsmæssige resultater er implementeringsprocessen endnu ikke blevet undersøgt. Formålet med afhandlingen var derfor at identificere betydningsfulde implementeringsfaktorer, som har påvirket implementeringsprocessen af Svendborgprojektet.

Metodologi:

Pragmatismen udgør det videnskabsteoretiske ståsted i afhandlingen. Hertil anvendes et indlejret mixed-methods design med udgangspunkt i fire forskellige metoder; i) semi-strukturerede interviews, ii) høj-strukturerede interviews, iii) spørgeskemaer og iiii) dokumentanalyse. Semi-strukturerede interviews har været den dominerende metode i afhandlingen. De resterende metoder er inddraget med henblik på at skabe en bredere, dybere og mere omfattende forståelse for implementeringen af Svendborgprojektet. Indsigt i implementeringsprocessen blev indsamlet via projektledere, skoleledere og idrætslærere.

Resultater:

Fire hovedfaktorer medvirkende til en vellykket implementering af Svendborgprojektet; i) projektet stemte overens med skolens eksisterende værdier og prioriteter, ii) projektledere har anvendt en kombination af 'top-down' og en 'bottom-up' tilgange, iii) idrætslærere deltog i et kompetencegivende kursus og iiii) mulighed for tilpasning af projektet til skolernes lokale forhold.

Konklusion:

Projektledere, skoleledere og idrætslærere fandt alle Svendborgprojektet relevant og muligt at implementere i den eksisterende skolepraksis. Implementeringen og vedligeholdelsen af projektet blev styrket gennem en kombination af en 'bottom-up' mentalitet via tidlig inddragelse af skolerne i beslutningsprocesserne, og en 'top-down' tilgang via centrale krav, som skolerne var påkrævet at gennemføre. Mulighed for tilpasning af projektet til den lokale skolepraksis, understøttede implementering af programmet og den løbende videreudvikling af projektet på de individuelle skoler. Projektets tilknytning til forskning sikrede central politisk støtte, som medvirkede til finansieringen af projektet, hvilket i sidste ende tillod muligheden for videreudviklingen, vedligeholdelsen og opskalering af projektet. Endelig understøttede et fagligt kompetenceforløb idrætslærernes evner og motivation til at implementere programmet.

1. Introduction

The introduction will initially address the importance of promoting physical activity (PA) in a school setting. This is followed by a presentation of the challenges arising when implementing such programmes. Lastly the Svendborgproject will be introduced as the programme forming the focus of the thesis.

1.1 Physical activity in a school context

Inactivity in childhood has been associated with obesity (Strong, Malina, Blimkie, Daniels, et al., 2005) and negative health consequences related to lifestyle diseases such as cardiovascular diseases and diabetes (Andersen, Hasselstrom, Gronfeldt, Hansen, et al., 2004; I. Janssen & Leblanc, 2010). However, globally only a fraction of school-aged children is conforming to the WHO guidelines stating that children should get at least one hour of moderate to vigorous physical activity (PA) a day (Inchley, Currie, Young, Samdal, et al., 2016; Kalman, Inchley, Sigmundova, Iannotti, et al., 2015). In a Danish context, is has been reported that only 13% of 11-15-year-old children accommodate the recommendation of 60 minutes of moderate to vigorous physical activity per day (Larsen, Troelsen, Kirkegaard, Riiskjaer, et al., 2016). This underlines the importance of promoting PA in children as an important public health priority (Hallal, Andersen, Bull, Guthold, et al., 2012; Inchley, et al., 2016; Kalman, et al., 2015). Schools have specifically been identified as a promising setting for promoting PA, since most children spend a large proportion of their weekdays at school. This means that school-based PA programmes have the potential to reach children of all socio-economic groups (Dobbins, Husson, DeCorby, & LaRocca, 2013; Langford, Bonell, Jones, Pouliou, et al., 2015; Reis, Salvo, Ogilvie, Lambert, et al., 2016; Waters, de Silva-Sanigorski, Hall, Brown, et al., 2011; WHO, 2018). However, PA programmes often face implementation challenges due to lack of information on how to replicate the programmes into a new context (Austin, Bell, Caperchione, & Mummery, 2011; Dobbins, Husson, DeCorby, & LaRocca, 2013; Naylor, Nettlefold, Race, Hoy, et al., 2015). Thus, there is a continuing need for implementation research that focuses on

how to translate promising PA programmes into everyday school practice (Antikainen & Ellis, 2011; Austin, Bell, Caperchione, & Mummery, 2011; De Meij, Chinapaw, Kremers, Van der Wal, et al., 2010; Naylor, et al., 2015; Saunders, Evans, Kenison, Workman, et al., 2013).
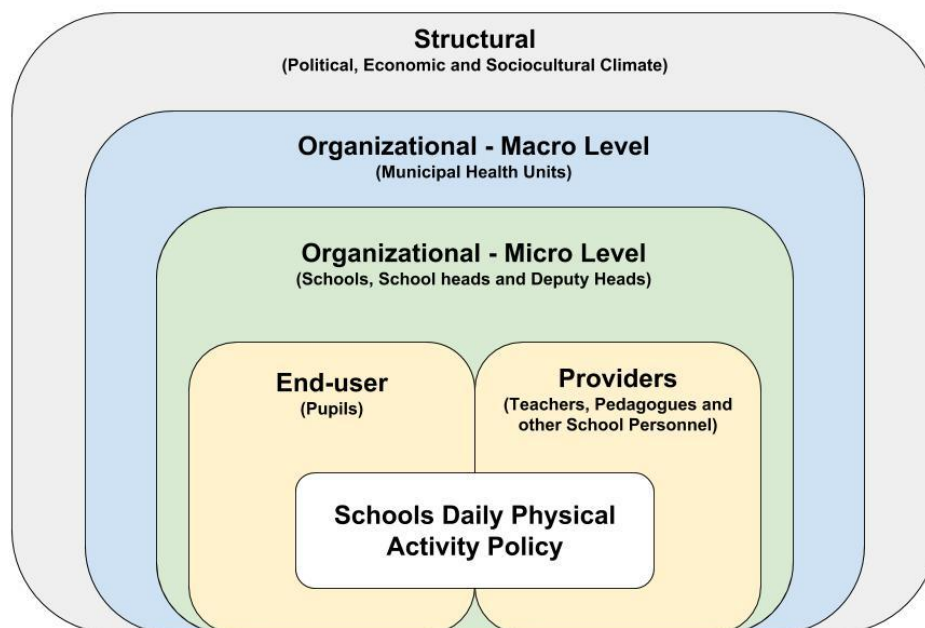
1.2 Implementation science

Awareness of the translation of research into practice has fostered considerable attention on research focusing on implementation (Durlak & DuPre, 2008; Eccles & Mittman, 2006; D. L. Fixsen, Naoom, Blase, Friedman, et al., 2005; Glasgow & Emmons, 2007; L. W. Green & Ottoson, 2004; Nilsen, 2015; Wandersman, Duffy, Flaspohler, Noonan, et al., 2008). Implementation is also the primary focus of this thesis in which it adopts Fixsen et al. definition of implementation as "*a specified set of activities designed to put into practice an activity or programme of known dimensions*" (D. L. Fixsen, et al., 2005). This definition centres around fidelity and the action of putting a pre-defined 'something' into practice. The process of implementing behaviour-related programmes has, however, proved to be a complex matter (Durlak & DuPre, 2008; D. L. Fixsen, et al., 2005; Nilsen, 2015; Ogden & Fixsen, 2014). Initially, when implementing PA in a school context, various programme levels influences the process (Chaudoir, Dugan, & Barr, 2013; Shah, Allison, Schoueri-Mychasiw, Pach, et al., 2017). These levels are presented in Figure 1 and includes I) a structural-level containing the political, economic and sociocultural climate, II) an organizational-macro level containing the municipal health unit, III) an organisational-micro level containing the local decisionmakers as schools, school heads and deputy heads, IV) a provider level containing the teachers, pedagogues and other school personnel, V) an end-user level containing the pupils.

Furthermore, the implementation of *a specified set of activities* is not simply a one-time action but an ongoing process, frequently unfolding over a period of years (R. M. Bertram, Blase, & Fixsen, 2015; Rogers, 2003). Initially, successful implementation relies on exploration and planning activities prior to any actual activity in practice (R. M. Bertram, Blase, & Fixsen, 2015; Metz & Albers, 2014; Rogers, 2003). These early stages are primarily driven by the organizational macro-level and contains careful

consideration of possible programme content and the match to, for instance, local communities, involved organizations, providers and end-users that are to adopt the programme (R. M. Bertram, Blase, & Fixsen, 2015; Metz & Albers, 2014). Furthermore, supporting structures to secure adoption and implementation fidelity on the organizational micro-level should be established (R. M. Bertram, Blase, & Fixsen, 2015; Metz & Albers, 2014). Following these initial stages, the programme is put into practice with a continuous focus on improvement and maintenance (R. M. Bertram, Blase, & Fixsen, 2015; Metz & Albers, 2014; Ogden & Fixsen, 2014; Rogers, 2003). This often requires adjustment of the programme – to accommodate and integrate viewpoints from various stakeholders such as practitioners and local decision-makers on the provider-level (Durlak & DuPre, 2008; Ogden & Fixsen, 2014). Based on these descriptions, the thesis defines a *successful implementation process* as containing I) planning activities prior to any actual activities being initiated in practice, II) a specified set of activities is adopted and implemented in practice with a constant focus on improvement and maintenance and III) including perspectives of various stakeholders such as practitioners and local decision-makers.

Achieving such a successful implementation process is not an easy task, yet imperative when employing research findings into real-world practice – meant as relatively uncontrolled and 'normal' settings, populations and conditions. This has fostered the emerging of research aimed at identifying factors influencing implementation processes and at developing better strategies for facilitating translation of scientific knowledge into real-world practice (Eccles & Mittman, 2006; Dean L. Fixsen & Ogden, 2014; Nilsen, 2015).

Figure 1: Programme levels influencing the implementation process – Adapted from (Chaudoir, Dugan, & Barr, 2013; Shah, et al., 2017)

1.3 Knowledge translation

The need for a implementation science is demonstrated through a substantial amount of literature documenting the 'gap' between research and practice impeding the translation of promising research programmes in real-world practice (R. C. Brownson & Jones, 2009; Glasgow & Emmons, 2007; L. W. Green, 2008; Greenhalgh, Robert, Macfarlane, Bate, et al., 2004; Hirschhorn, Ramaswamy, Devnani, Wandersman, et al., 2018; R. Kessler & Glasgow, 2011; Leone & Pesce, 2017; Research, 2012; Wandersman, et al., 2008). This is troublesome as it hinders potential health benefits for end users (Glasgow, 2013; Glasgow & Emmons, 2007; L. W. Green & Ottoson, 2004; Lobb & Colditz, 2013; Ogden & Fixsen, 2014). The gap has been associated with a research-dominating focus on creating 'evidence' and establishing a valid foundation for promising PA programmes (L. W. Green, 2008; R. Kessler & Glasgow, 2011). However, identifying the basic constructs of programmes for them to result in better health outcomes is only the first step of achieving healthier school children. To adopt promising programmes, local decision-makers need to consider which kind of evidence is relevant and suitable for the specific setting, whereas policy-makers are concerned with the breath of conditions of which the

evidence is applicable (Glasgow & Emmons, 2007). Thus, there is a need to aid the translation and dissemination of research by documenting contextual factors and the implementation process of promising programmes (Glasgow & Emmons, 2007; L. W. Green, 2008; R. Kessler & Glasgow, 2011).

L. W. Green also suggested a need for more practice-based research in order to bridge the gap between research and practice (L. W. Green, 2008; Wilson, Brady, & Lesesne, 2011). The proposal to investigate how programmes are implemented in practice-based settings is a promising attempt to enhance the possible transferability of research as it helps identify important implementation factors that are relevant for practitioners, decision-makers and policy-makers (Glasgow, Davidson, Dobkin, Ockene, et al., 2006; Glasgow & Emmons, 2007; L. W. Green, 2008). Also, practice-based research potentially enhances the transferability of the programmes investigated, as they become more context-relevant and easier to adapt to local practices, end-users and populations (Glasgow & Emmons, 2007; L. W. Green, 2008; R. Kessler & Glasgow, 2011).

Various frameworks and process models have emerged to facilitate the process of knowledge translation (Ross C. Brownson, Colditz, & Proctor, 2018; C. A. Estabrooks, Thompson, Lovely, & Hofmeyer, 2006; Graham, Logan, Harrison, Straus, et al., 2006; Mitchell, Fisher, Hastings, Silverman, et al., 2010; Wilson, Brady, & Lesesne, 2011). Knowledge translation is understood as the process and steps needed to ensure effective and widespread use of knowledge from promising programmes, research evidence or effective policies (Wilson, Brady, & Lesesne, 2011). One of these is the 'Knowledge to Action (K2A) Framework (Figure 2) (Wilson, Brady, & Lesesne, 2011). The K2A Framework is developed to strengthening the exchange of practice-based knowledge (going from right to left in Figure 2) as well as facilitate knowledge translation through research developing and testing new programmes in practice (going from left to right in Figure 2)(Wilson, Brady, & Lesesne, 2011). Through K2A three main phases are identified in order to translate research into practice; i) a research phase, ii) a translation phase and iii) an institutionalization phase. In the research phase, emphasis is put on determining programme

appropriateness for translation through both effectiveness and implementation measures. The research phase is realised with translation in mind, but before any translation of knowledge has been undertaken. Thus, an important part of closing the gap between research and practice is to allow decision-makers and practitioners to decide a programs potential application in real-world conditions (Glasgow & Emmons, 2007; Wilson, Brady, & Lesesne, 2011). This, in order to enable and qualify the decision to translate through either scaling-up existing promising programmes or creating new ones (Wilson, Brady, & Lesesne, 2011). Based on these perspectives, the thesis positions itself in the research phase of the K2A framework (Figure 2), focusing on implementation measures.

Figure 2: The Knowledge to Action framework adapted from Wilson, Brady, & Lesesne, 2011
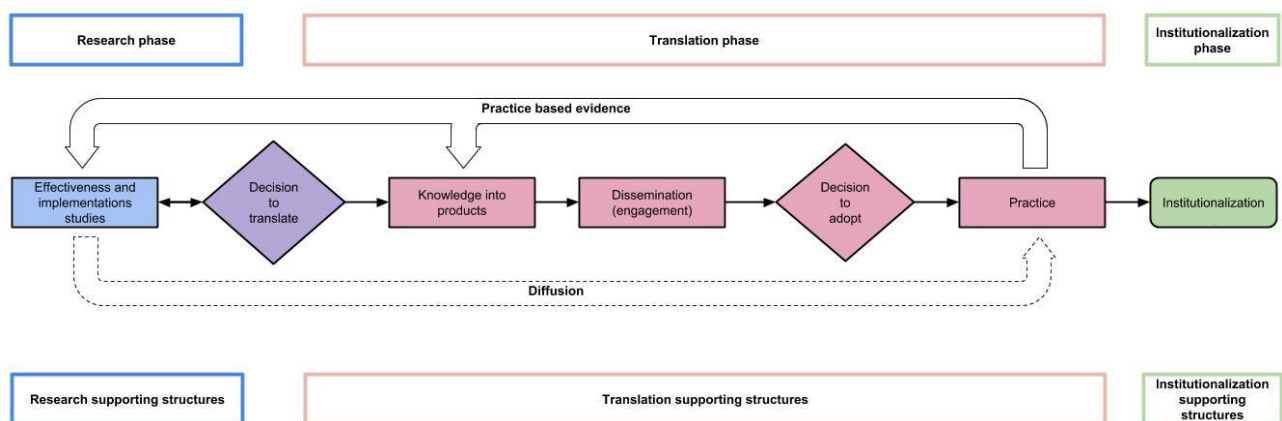
1.4 Process evaluations

Before a 'decision to translate' knowledge from promising programmes, it is important to document a programme's ability to prove effective in order for practitioners and decision-makers to assess its potential usefulness (Hulscher, Laurant, & Grol, 2003; Moore, Audrey, Barker, Bond, et al., 2015; Saunders, Evans, & Joshi, 2005). However, programmes that neglect to document the implementation process and change mechanisms leading to its specific outcomes is only able to document that 'something' happened, but not what caused it. Hereby, both aspects of intervention- and implementation-outcome must be documented when dealing with process evaluations (D. L. Fixsen, et

al., 2005; Saunders, Evans, & Joshi, 2005). Primary attention on implementation-outcomes is, however, often promoted after effectiveness has been confirmed. This is based on the argument that a more 'efficient' way to establish effective health promotion in practice, is to only use resources and learn from programmes we know 'works' in practice (Peters, Tran, Adam, Alliance for Health, et al., 2013; Rimer, Glanz, & Rasband, 2001). Thus, upon evaluating effectiveness of a programme, the main goal is to place focus on the determinants for the successful implementation process, allowing practitioners and decision-makers to identify effective programmes and learn how to improve those that are not (Hulscher, Laurant, & Grol, 2003; Moore, et al., 2015; Ogden & Fixsen, 2014; Saunders, Evans, & Joshi, 2005). Such process evaluations, after the programme has run its course, are characterized as summative and involve concerns of programme fidelity, assessing the quantity and quality of the programme and a deeper understanding of the context in which the effects were produced (Moore, et al., 2015; Rogers, 2003; Saunders, Evans, & Joshi, 2005). Hereby, aspects of implementation naturally becomes the primary focus (Peters, et al., 2013).

The increased interest in implementation science has led to the development of an extensive amount of possible strategies to guide these process evaluations (Nilsen, 2015). This includes process models guiding the implementation process (Meyers, Durlak, & Wandersman, 2012; Research, 2012; Wilson, Brady, & Lesesne, 2011), determination frameworks describing how implementation is affected (R. M. Bertram, Blase, & Fixsen, 2015; Durlak & DuPre, 2008; D. L. Fixsen, Blase, Naoom, & Wallace, 2009; Metz & Albers, 2014), evaluation frameworks to assess the implementation efforts (Glasgow, Vogt, & Boles, 1999; L. Green & Kreuter, 2005) and checklists for recommended reporting in relation to programme replication (Albrecht, Archibald, Arseneau, & Scott, 2013; Hoffmann, Glasziou, Boutron, Milne, et al., 2014).

Even though the purpose of models, frameworks and checklists display wide variations, they all describe aspects of implementation processes that are important to evaluate (Nilsen, 2015). In general, three

important aspects can be identified when performing process evaluations; a) the willingness to adopt the programme, b) the implementation process, and c) the programme's ability to be maintained over several years (R. M. Bertram, Blase, & Fixsen, 2015; Durlak & DuPre, 2008; Gaglio, Phillips, Heurtin-Roberts, Sanchez, et al., 2014; Glasgow, Vogt, & Boles, 1999; Metz & Albers, 2014; Nilsen, 2015; Owen, Glanz, Sallis, & Kelder, 2006). In accordance to the previous definition of a successful implementation process (section 1.2, page 15), this entails detailed descriptions of the programme as planned, of the actual delivery of the programme and of the experiences of providers involved (Hulscher, Laurant, & Grol, 2003; Moore, et al., 2015; Ogden & Fixsen, 2014; Saunders, Evans, & Joshi, 2005). By also exploring the various programme levels, potentially influencing the implementation process of PA in a school context (Figure 1, page 16), such process evaluations ultimately enhance the transferability of a programme by allowing practitioners and decision-makers to identify and adopt promising programmes that fit their local context. Furthermore, the knowledge gained from such process evaluations can potentially accommodate the continuing need for strategies on how to translate and disseminate PA programmes into everyday school practice with meaningful outcomes. Still, it is important to notice that process evaluations, documenting both the effectiveness and the implementation process, primarily strengthen the foundation for possible translation. Yet, however 'transfer friendly' a programme might be, implementation in a new setting depends on the local organization, politicians and practitioners having the willingness to translate, as well as having sufficient supporting structures and resources (Wilson, Brady, & Lesesne, 2011).

1.5 The Svendborgproject

The Svendborgproject is a real-world health promotion programme encouraging PA in primary schools through the addition of three times the amount of physical education (PE). The incentive for establishing the programme came when municipal authorities in the Danish municipality of Svendborg initiated a partnership with Team Denmark (the Danish Elite Sport Foundation), adding a focus on the promotion of PE in primary schools in 2008. The programme was initially initiated on six schools, who still is part

of the programme after a period of ten years – four located in rural areas and two in suburban. Furthermore, the programme has been scaled up to include all schools in the municipality. Data from the Danish Database of National Statistics (www.statistikbanken.dk, 2018) show that the municipality, on a number of relevant aspects for a school-based intervention, represent a normal Danish municipality (Table 1). Both the population size, the average disposable household income, the number of pupils and the number of children per teacher in the public schools in Svendborg municipality, were close to the average Danish municipality around the time of programme initiation in 2008 and in 2018 (Table 1). Furthermore, public schools in Denmark are funded by taxes and managed by municipal authorities. Table 1 shows that budgets for the public schools in Svendborg municipality also were close to the average Danish municipality at programme initiation in 2008 and in 2018 (Table 1).

Table 1: School and culture budgets in 2008 and 2018 in the municipality of Svendborg and the average Danish municipality

Public school budgets	The municipality of Svendborg	The average municipality in Denmark
In 2008	338.771.000 Danish kroner (45.366.000 Euro)	320.400.000 Danish kroner (42.906.000 Euro)
In 2018	381.334.000 Danish kroner (51.066.000 Euro)	365.610.000 Danish kroner (48.960.000Euro)
Number of pupils in public schools		
In 2008	5739	5929
In 2017[1]	5220	5536
Average population size		
In 2008	59,040	55,875
In 2018	58.698	58.992
Average disposable household income[2]		
In 2008	280.000 Danish kroner (37.500 Euro)	285.600 Danish kroner (38.250 Euro)
In 2017[1]	345.000 Danish kroner (46.200 Euro)	368.400 Danish kroner (49.300 Euro)
Average teacher/pupil ratio		
In 2009[3]	18.7	20.1
In 2017[1]	20,6	21,5

1 no national data could be located for 2018

2 Disposable income is the amount of money that a household has available for spending and saving after income taxes and interest expenses have been accounted for.

3 no national data could be located for 2008

1.5.1 Programme requirements

The planning of the Svendborg was initiated in 2006 and were driven by municipal employees heavily involved in the initiation of the partnership with Team Denmark. These employees also took on the role of programme manager and initially designed the outline of the programme. Although the Svendborgproject to a minor degree was funded by and collaborated with Team Denmark, the programme did not adopt an elite sport focus. Based on the outline of the programme, all 19 public schools in the municipality were invited to co-develop the programme. Eventually, six of the schools

chose to initiate the programme, implementing a relatively simple concept consisting of three required programme elements: (i) the pupils in pre-school to fourth grade were to receive 4.5 hours of PE distributed across a minimum of three days a week at programme start-up, to be gradually integrated into the fifth and the sixth grade over the next two years; (ii) PE teachers had to participate in a professional development course based on an Age-Related Training concept (ATC), stressing the importance of training children in a biologically relevant manner to accord with their physical and physiological maturity (Bach & Eiberg, 2010; Pryce, Willeberg, Falkentoft, & Meyhoff, 2005); (iii) the schools had to assign a programme promoter (school staff member), who was to act as a link between their school and the programme managers. Besides these three requirements, there were two additional elements that was highly recommended for schools to implement: (i) programme promoters should participate in collaboration meetings with programme managers and promoters from other schools, and (ii) PE teachers should plan some of their lessons as outdoor PE. Overall, this aimed to give pupils an improved quality of PE and triple the amount.

1.5.2 The connection of research

The Svendborgproject was developed and evolved independently of researchers, though researchers were allowed to follow the programme when it was initiated at the schools in 2008. This led to a substantial programme of research, the Childhood Health, Activity, and Motor Performance School Study Denmark (the CHAMPS-study DK), being connected to the Svendborgproject. The CHAMPS-study DK had several objectives that can be divided into two main areas of interest: i) to identify the effects on the physical health and cognitive performance and academic achievement of children engaged in the Svendborgproject, and ii) to evaluate the implementation process in order to establish recommendations on how to translate new findings from school-based PE programmes into practice and identify applicable procedures to design and implement multifaceted PA initiatives at the school level. In accordance to the first objective a multifaceted quasi-experimental study was established in order to address the overall effectiveness evaluation of the Svendborgprojekt (Wedderkopp, Jespersen,

Franz, Klakk, et al., 2012). Applying the research programme appealed to the politicians of the municipality as it would document the effectiveness of the programme. Thus, in early 2008 politicians decided to allocate funds to co-finance the expenses of running the programme for all enrolled schools for three years.

1.5.3 Programme effectiveness

The CHAMPS-study DK has proved the Svendborgproject effective through pupils becoming more active during school time (Moller, Tarp, Kamelarczyk, Brond, et al., 2014) as well as decreasing the incidents of overweight and obesity (Klakk, Chinapaw, Heidemann, Andersen, et al., 2013), reducing cardiovascular risk factors (Klakk, Andersen, Heidemann, Moller, et al., 2014) and improving fitness in pupils with low fitness levels (Rexen, Ersboll, Moller, Klakk, et al., 2014). Subsequently, researchers also demonstrated that the high increase of PE had no negative effect on the academic ability of children and young people involved (Bugge, Moller, Tarp, Hillman, et al., 2017). The research findings proved important for political decision-makers because they suggested that the health benefits of extra PE lessons especially reach children and adolescents who were otherwise rather sedentary in their leisure time. This, without degrading the schools' main objective of teaching and evolving pupils' academic abilities. These reports triggered even higher political interest, and after the initial three years, the local government announced that the municipality would allocate the funds necessary to involve all schools fully in the programme. All schools in the municipality chose to become part of the programme, and in 2012 an adapted programme, adding two new requirements, were initiated at all schools in the municipality. The new requirements added to the programme were i) that three hours of the PE had to include ATC-related content and ii) that pupils had to get 20 minutes of high intensity activity in each PE session. An overview of the Svendborgproject covering how the programme has evolved over time and its programme elements, both required and highly recommended, is provided in Figure 3. Although the Svendborgproject has proved successful on various parameters, detailed descriptions are absent regarding the planning of the programme, the actual delivery of the programme and the experiences of

providers involved. The thesis relates to the second aim of the CHAMPS-study DK, adding implementation as the primary focus to produce a deeper understanding of the context in which the effects of the Svendborgproject were produced. Ultimately, to identify applicable procedures to design and implement multifaceted PA initiatives at the school level.

Figure 3: Overview of the Svendborgproject covering how the programme has evolved over time and both required and highly recommended programme elements
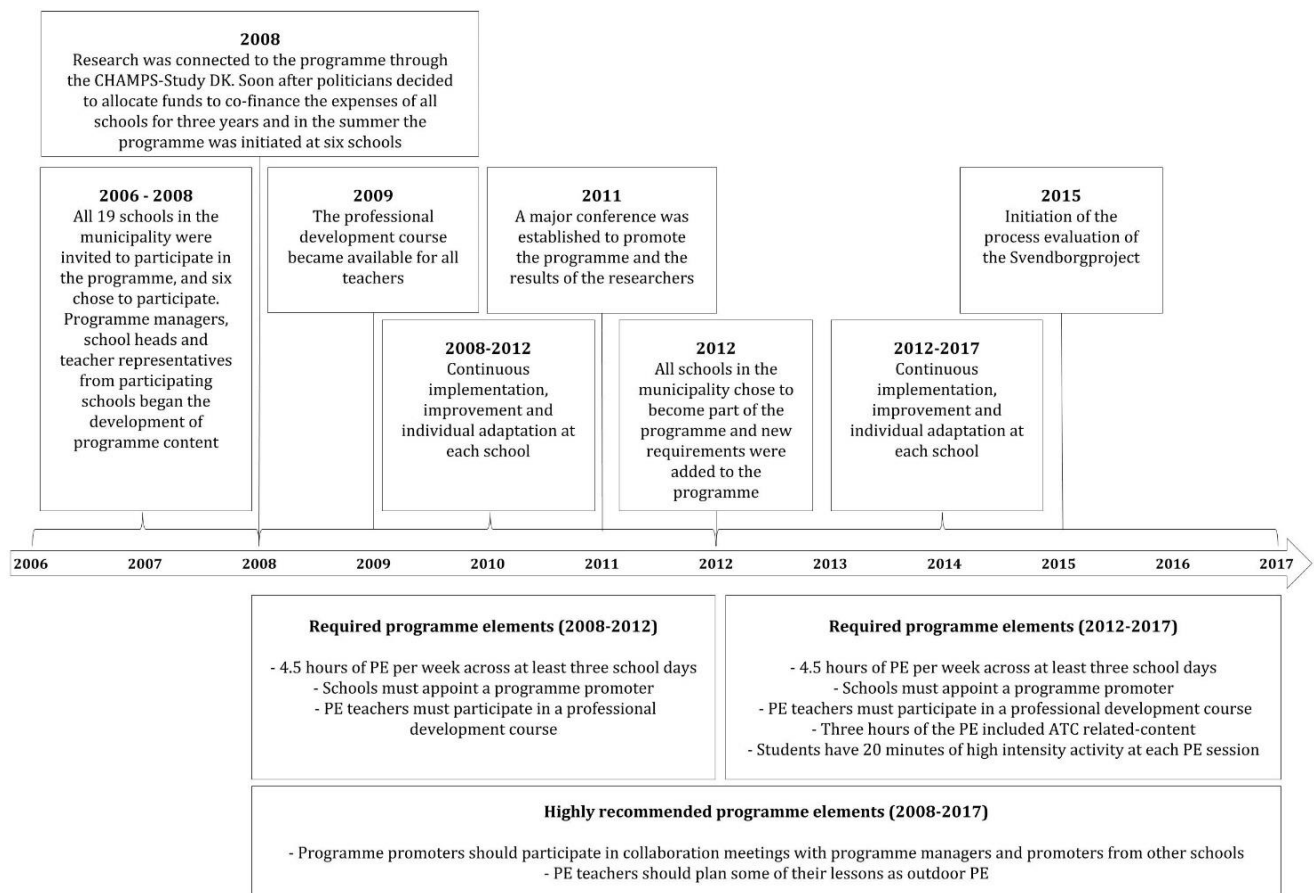
1.6 Aim and research objectives

Implementing real-world programmes is a complex matter and there is an ongoing need for effective strategies to promote dissemination and translation of promising PA programmes into a school context (Antikainen & Ellis, 2011; Carlson, Engelberg, Cain, Conway, et al., 2017; Dobbins, Husson, DeCorby, & LaRocca, 2013; P. Estabrooks, Dzewaltowski, Glasgow, & Klesges, 2003; Pearson, Chilton, Wyatt, Abraham, et al., 2015; Schaap, Bessems, Otten, Kremers, et al., 2018). One purpose of implementation

science is to support the promotion of effective programmes. This argument is based on the notion, that the most efficient way to establish effective health promotion in practice, is to learn from programmes we know 'works' in practice (Peters, et al., 2013; Rimer, Glanz, & Rasband, 2001). The argument underlines the relevance of investigating real-world programmes such as the Svendborgproject which has shown the ability to generate both positive impacts and be maintained for a period of ten years. The programme is considered a unique opportunity to gain insight on how to obtain successful implementation of more PE in primary school, providing valuable information for future PA and PE programmes in a Danish school context. Also, the identification of effective strategies to promote, implement and maintain school-based PE and PA programmes, can potentially complement existing knowledge in the field of implementation and international literature. Thus, the question remains as to how and why the Svendborgproject succeeded with relevant impact? Which factors influenced its initiation, implementation and maintenance? And how was the programme adopted among the programme managers, school heads and PE teachers?

Building on questions like these, the thesis performs a process evaluation of the Svendborgproject. The aim is to identify important factors that have influenced the successful implementation process of the Svendborgproject. Special attention will be given to contextual factors to clarify how these implementation factors have been applied in order to enable translation to future school-based PA programmes. Figure 4 visualizes how the CHAMPS-study DK constitutes the research phase prior to translation of the knowledge gathered through the Svendborgproject – either through scaling-up the programme or creating a new one. The thesis feeds into the effectiveness part of the CHAMPS-study DK with implementation aspects as the primary focus. Hereby the thesis intent to clarify under which conditions the programme has been implemented and maintained while still being effective. Thus, special attention will be given to the six original schools participating in the programme and on which the effectiveness of the programme was based.

Figure 4: Adoption of the K2A framework visualizing the CHAMPS-study DK in relation to the process of translating the Svendborgproject into other practices
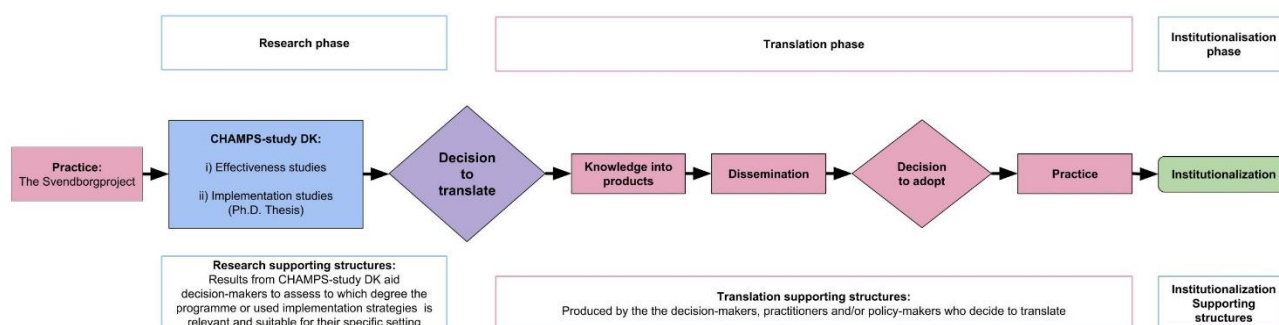
In answering the aim of the thesis, three studies with three different research objectives relating to the applied definition of a successful implementation process was designed; i) the planning of the programme, ii) the actual delivery of the programme and iii) the experiences of providers involved. As argued (section 1.4, page 20), these are also important aspects to report in order to identify important change mechanisms that potentially aid practitioners and decision-makers on how to translate and disseminate PA programmes into everyday school practice with meaningful outcomes. Additionally, in order to analyse how the implementation process progresses across varies programme levels (Figure 1, page 16), each of the studies has a special focus on a specific level. The studies are documented in three papers, and their objectives were:

Study I: To analyse the initiation and planned implementation of the Svendborgproject with special attention on the experiences of programme managers on the organizational macro-level.

Study II: To analyse the process of adoption, implementation and maintenance of the Svendborgproject with a special attention on change in school practice on organizational micro-level.

Study III: To analyse provider and programme characteristics of the Svendborgproject with special attention on the experience of school heads and PE teachers on the provider-level.

1.7 Operationalisation

Pragmatism constitutes the scientific theoretical foundation of the thesis with strict abduction as the basis of inference. An embedded mixed method design is used applying four different methods; i) semi-structured interviews, ii) highly-structured interviews, iii) questionnaires and iiii) document analysis. The three studies mentioned above have different objectives and apply different methods and frameworks. Three frameworks are employed; I) stages of implementation (Metz & Albers, 2014), II) RE-AIM (Glasgow, Vogt, & Boles, 1999) and III) The ecological framework (Durlak & DuPre, 2008). Through the results section main findings across the three studies are presented and are compared to previous literature in the discussion section. Finally, the conclusion sum up the main factors influencing the implementation of the Svendborgproject and implications for practice is presented. Figure 5 illustrates the operationalization of the thesis, including the aim, the scientific theoretical approach, the methodological approach, the individual studies and how the findings across studies, the discussion and the conclusion are reported.

Figure 5: An overview of the operationalization of the thesis, including the aim, the scientific theoretical approach, the methodological approach, the individual studies and how the findings across studies, the discussion and the conclusion are reported.
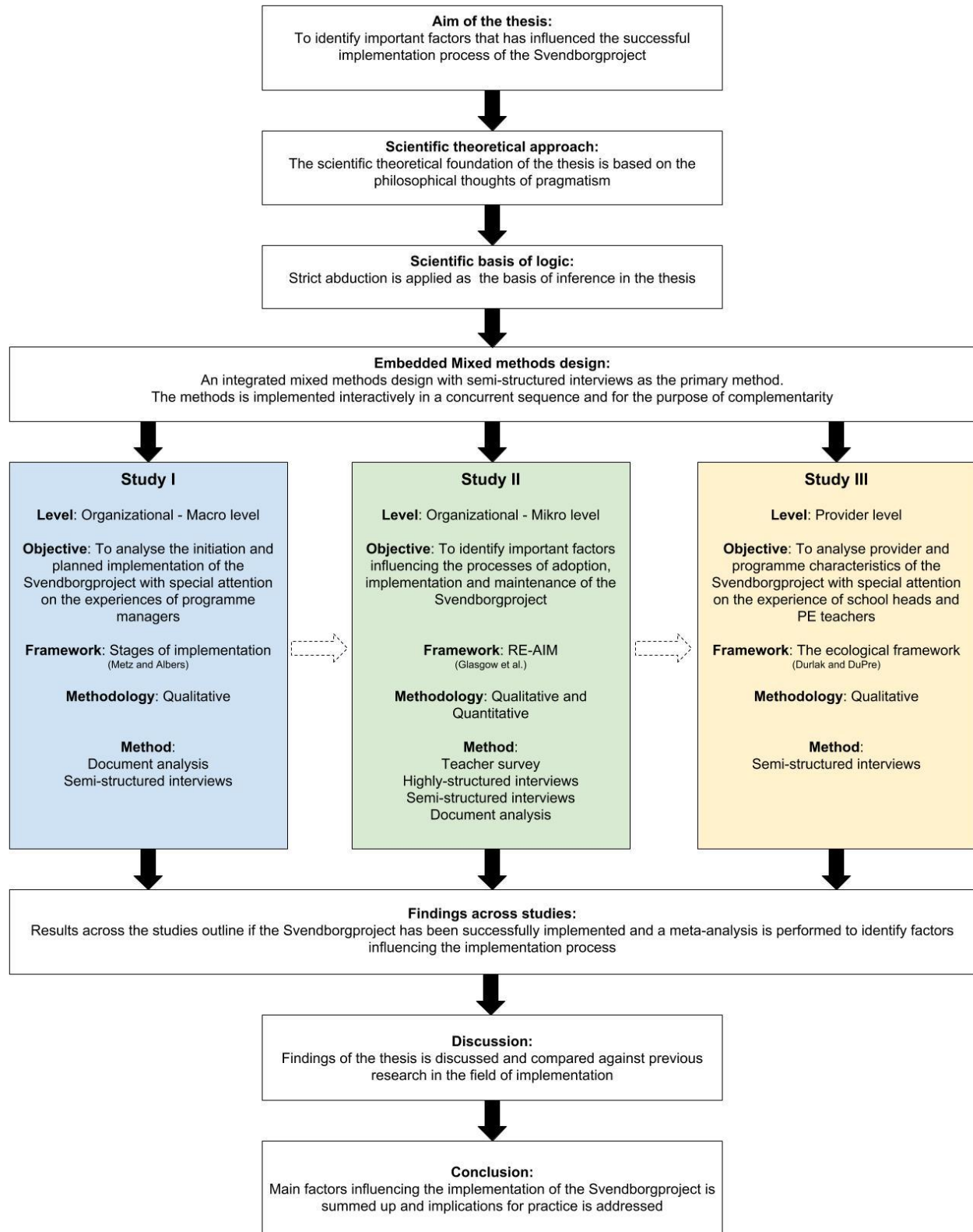
2. Scientific theoretical approach

The scientific theoretical foundation of the thesis is based on the philosophical thoughts of pragmatism. This section will present the key perspectives of pragmatism and how pragmatism relates to the field of implementation, to performing a process evaluation and to the scientific approach adopted in the thesis. Finally, abduction will be presented as the main theory of inference and mode of reasoning in the thesis.

2.1 Pragmatism

The founding fathers of pragmatism are Charles Sanders Peirce, William James and John Dewey, who endorse practice as the main component for solving empirical and practical problems in the real-world (Brinkmann, 2006; Dewey & Dewey, 1910; Johnson & Onwuegbuzie, 2004). This underlying principle of pragmatism is defined in what is deemed the pragmatic stance; *"Consider what effects, which might conceivably have practical bearings, we conceive the object of our conception to have. Then the whole of our conception of those effects is the whole of our conception of the object"* (Peirce et al., 1992, p. 132). Through the pragmatic stance, attention is drawn to practice both as the catalyst for all knowledge and as the testimony for knowledge being valid (Brinkmann, 2006; Dewey, 1958; Charles S. Peirce, Houser, Kloesel, & Peirce Edition, 1992). To determine the truth of our knowledge, James states that we need to ask the usual pragmatic question: "*Grant an idea or belief to be true... what concrete difference will its being true make in anyone's actual life? How will the truth be realized? What experiences will be different from those which would obtain if the belief were false? What, in short, is the truth's cash-value in experiential terms?*" (James, 1907, Lecture VI). This implies that whenever we have two choices, we need to estimate what practical differences each will bring to the problem at hand. If no practical difference is found, then they must both be applicable (James, 1907). In the following, these key perspectives of pragmatism will be related to the thesis.

2.2 Pragmatism and implementation science

By applying a pragmatic approach, attention is directed at actions that can facilitate potential outcomes deemed relevant and valuable in a local practice and exploring how such actions can be implemented in wide-spread practice (Johnson & Onwuegbuzie, 2004; Morgan, 2007; Charles S. Peirce, Houser, Kloesel, & Peirce Edition, 1992). These pragmatic perspectives have clear links to implementation science (Gaglio, et al., 2014; Glasgow, 2013). The link to pragmatism is represented in the large amount of implementation research focusing on the application of programmes under normal conditions in order to promote transparency and enable practitioners and policymakers to integrate evidence into practice (Durlak & DuPre, 2008; D. L. Fixsen, et al., 2005; Gaglio, et al., 2014; Glasgow, 2013; Ogden & Fixsen, 2014). Hereby, implementation research is to some degree in tune with the logic of pragmatism in not being devoted to the *pursuit of knowledge* through inquiries but to the *gaining of knowledge* in the pursuit of solving specific situational problems (Morgan, 2007). Regarding the present thesis, the aim is not to pursue knowledge about health benefits of increased school PA, but to gain knowledge that contribute to the implementation of successful programmes to enhance possibility of health benefits. Through the identification of relevant factors influencing the implementation of the Svendborgproject, the thesis aims to gain knowledge on how to implement and maintain school-based PA programmes while still producing relevant health outcomes. Still, knowledge of effectiveness is a vital element qualifying the decision to translate by clarifying if the programme increases children's PA levels in school and their health status. In sum, pragmatism aligns with the basic perspectives of implementation research and directs the thesis towards the importance of creating transparent knowledge usable for solving practical problems in the real-world.

2.3 Pragmatism and evaluations

Dewey states that scientific inquiry should carefully observe occurrences in different conditions for the purpose of identifying the special conditions that are present in cases of success and failure (Dewey & Dewey, 1910). The special conditions would then be considered the explanation and the way to

understand the occurrence (Dewey & Dewey, 1910). In the thesis, the occurrence would apply to the implementation of the Svendborgproject, and the specific conditions observed during the process evaluation would hereby become the key to understanding how and why the implementation was successful. However, the knowledge gained from such a process evaluation should also be applicable in other similar programmes in other contexts (Morgan, 2007). In order to estimate the applicability of the Svendborgproject a more elaborate description on the programme is however needed. This calls for clear documentation of the programme, the change mechanisms undergoing the implementation process, the individual school context in which the programme was implemented as well as the perspectives of school heads and PE teachers as key implementers. Supported by the pragmatic question 'What difference does it make?', the argumentation is decisively directed towards a more important consideration as to whether we can use the knowledge learned from one type of method in a specific setting and make appropriate use of it in another (Johnson & Onwuegbuzie, 2004; Morgan, 2007). In this manner, the thesis is promoting transferability as the main quality criteria. This involves the steps needed to enable effective and widespread use of the knowledge gained through the Svendborgproject. Ultimately, allowing practitioners and decision-makers to identify whether they find the programme relevant and fitting for their individual context.

2.4 Pragmatism and scientific inquiry

The Svendborgproject has been promoted as both implemented and maintained for a period of ten years. This is somewhat a surprising fact due to implementation of behaviour-related programmes being a complex matter (Durlak & DuPre, 2008; D. L. Fixsen, et al., 2005; Nilsen, 2015; Ogden & Fixsen, 2014), often facing challenges of local practice adoption (Dobbins, Husson, DeCorby, & LaRocca, 2013; Glasgow & Emmons, 2007; Naylor, et al., 2015). Based on the earlier sections of the thesis (section 1.2, page 14) a logical explanation would be that the Svendborgproject must have completed a successful implementation process in order for this to be true. Hence, there is reason to suspect that the Svendborgproject has completed the steps of a successful implementation process (section 1.2, page

15). Such reasoning is essentially abductive inference and part of the scientific basis of logic that the thesis adopts.

2.4.1 Abduction

Abduction as a theory of inference was developed by Charles Sanders Peirce and is considered to be an essential part of pragmatic thinking (C.S. Peirce & Hartshorne, 1974; Raholm, 2010; Reichertz, 2014). Through this mode of reasoning, research is initiated based on a problem or 'a surprising fact' and aims at proposing explanations through explanatory hypothesis (Raholm, 2010; Reichertz, 2014). The surprising fact is formed through unfamiliar knowledge, that is then, connected to pre-existing knowledge to propose an explanations (Raholm, 2010; Reichertz, 2014); "*We turn over our recollections of observed facts; we endeavour so to rearrange them, to view them in such new perspective that the unexpected experience shall no longer appear surprising*" (C.S. Peirce & Hartshorne, 1974). Through this abductive reasoning no theoretical predisposition is taken, as it is driven by empirical observations, seeking a theory to explain the surprised fact (Raholm, 2010; Reichertz, 2014). This kind of inference is driven by contextual observations on which meaningful explanations are proposed as a workable theory (Reichertz, 2014). It is important to emphasise that, based on the pragmatic outset, the quality of the proposed explanations is solely validated by their viability and continues value in practice (Charles S. Peirce, Houser, Kloesel, & Peirce Edition, 1992; Reichertz, 2014). The abductive process of reasoning can be described as followed;

1. The surprising fact, Q, is observed!
2. If A were true, Q would be a matter of course.
   Hence
3. There is a reason to suspect that A is true (Fann, 1970; Shook, 2015)

In the thesis this form of abduction is applied in the following:

The municipal promote the Svendborgproject as implemented and maintained for ten years (Q). Suppose that the Svendborgproject has completed a successful implementation process (A) – this would explain the observation om the organizational macro-level (Q). Thus, there is a reason to suspect that the Svendborgproject has completed a successful implementation process

Pure abductive reasoning can, however, be classified as a non-scientific procedure and has been associated with the simple act of guessing (Raholm, 2010; Reichertz, 2014). This is due to its production of rather uncertain explanations 'suggesting' that something may be and therefore vulnerable for fallacies (Raholm, 2010; Shook, 2015). The aim of the thesis is to identify important factors that have influenced the successful implementation process of the Svendborgproject. However, detailed descriptions of programme implementation are absent and engaging the search for important implementation factors, based on pure abduction, only suggesting that the Svendborgproject has been successfully implemented, is not a sustainable design. Peirce states, such suggested explanations may (by chance) by true, but in order for it to become knowledge the explanation must be justified: "*Plato is quite right in saying that a true belief is not necessarily knowledge... While faith [in true belief] might just as easily be attached to a gross superstition as to a noble truth, it may, by good luck, happen to be perfectly true. But can it be said to be known? By no means... it must be known what justifies the belief and just WHY and HOW the justification is sufficient*" (C.S. Peirce & Hartshorne, 1974). Principally scientific inquiry should advance by assuming that simple 'truths' are, in fact, a complex matter (Dewey & Dewey, 1910; Raholm, 2010) and empirical insight is needed in order to confirm if the programme has been successfully implemented. In order to strengthen the foundation on which the conclusion are drawn, the thesis applies deducibly abductive abduction (strict abduction) – moving from non-scientific suggestions to scientific reasoning (Shook, 2015).

2.4.2 Strict abduction

Through strict abduction, distinct elements are deduced from *the proposed explanation*, but then abductively related to other conditions (Shook, 2015). These elements are deduced from the thesis' definition of a successful implementation process (section 1.2, page 15) stating; I) that planning activities should be initiated prior to any actual activities being initiated in practice, II) that a specified set of activities should be adopted and implemented in practice with a constant focus on improvement and maintenance and III) that perspectives of various stakeholders such as practitioners and local decision-makers should be included. By proposing that the implementation of the Svendborgproject hold these specific *implementation process elements*, concrete predictions are made and the proposed explanation must behave in a patterned way in order for it to be elevated from being suggestive and become knowledge (C.S. Peirce & Hartshorne, 1974; Shook, 2015).

The suspected truthfulness of a proposed explanation can also be strengthened by breaking it into a number of lesser parts in order to examine its compatibility in varying conditions (Dewey & Dewey, 1910; Raholm, 2010). Thus, the proposed explanation, that the Svendborgproject has been successfully implemented, is observed across different programme levels (Figure 1, page 16). The three deduced implementation process elements and the three programme levels are examined through the three sub-studies in the thesis; study I) the initiation and planned implementation on the organizational macro-level; study II) the adoption, implementation and maintenance on the organizational micro-level and; study III) the provider and programme characteristics on the provider-level. The process of strict abduction reasoning can be described as follows:

1. The surprising fact, Q, is observed!
2. Suppose A (only if A contains element I), then Q
3. Suppose A (only if A contains element I-II), then Q and R
4. R!

5. Suppose A (only if A contains element I-III), then Q, R and S

6. S!

   Hence

7. There is a reason to suspect that A (containing element I-III) is true (Shook, 2015)

In the thesis this form of strict abduction is applied in the following:

The municipality promote the Svendborgproject as implemented and maintained for ten years (Q). Suppose that the Svendborgproject has completed a successful implementation process (A), demanding that planning activities were initiated prior to any actual activities being initiated in practice, (implementation process element I) – this would explain the observation on the organizational macro-level (Q).

Suppose that the Svendborgproject has completed a successful implementation process (A), demanding that planning activities were initiated prior to any actual activities being initiated in practice and that a specified set of activities is adopted and implemented in practice with a constant focus on improvement and maintenance (implementation process element I and II) – this would explain implementation of the Svendborgproject on the organizational macro and micro level (Q and R).

Suppose that the Svendborgproject has completed a successful implementation process (A), demanding that both planning activities were initiated prior to any actual activities being initiated in practice, that a specified set of activities is adopted and implemented in practice with a constant focus on improvement and maintenance, and that perspectives of various stakeholders such as practitioners and local decision-makers were included (implementation process element I, II and III) – this would explain the implementation of the Svendborgproject on the organizational macro, micro and provider level (Q, R and S)

Unless these predictions go badly, there is a reason to suspect that the Svendborgproject has completed a successful implementation process (A, having implementation process element I, II and III).

This process of strict abduction can result in three variations; i) either none of the implementation process elements are present and the definition is cast away, making the observation a puzzle once again and a new proposed explanation is formed; ii) some of the implementation process elements are present while others are not, thus, the definition must be adjusted to only included the present elements; iii) all implementation process elements are present and the observation is explained (Shook, 2015). Establishing if the individual implementation process element is present, is an important first step in order to fulfil the aim of the thesis, as it justifies the foundation on which the conclusions are drawn. Furthermore, through the exploration of the three implementation process elements, in-depth knowledge of the programme and underlining choices of action is collected, enabling the identification of factors influencing the implementation process in the Svendborgproject.

The application of strict abduction in the thesis is visualized in Figure 6, showing how the proposed explanation is divided into three different implementation process elements and linked to the three studies. As the individual studies have a strict focus on exploring a specific and predefined implementation process element, the studies should be viewed as individual strands and not influencing the aim or design of each other. Yet, based on the abductive approach, knowledge gained from a previous studie is still actively used to supplement and bring perspectives into the next (the dottet arrows between the studies in Figure 6) (Shook, 2015). For example, contextual and historical perspectives regarding the planning and preparation in study I allows for a more comprehensive understanding of the adoption, implementation and maintenance in study II. Furthermore, study II ads to the collected sum of knowledge, providing contextual perspectives regarding change in practice and longterm maintenance at the schools, complimenting the exploration of the provider perspective in study III.
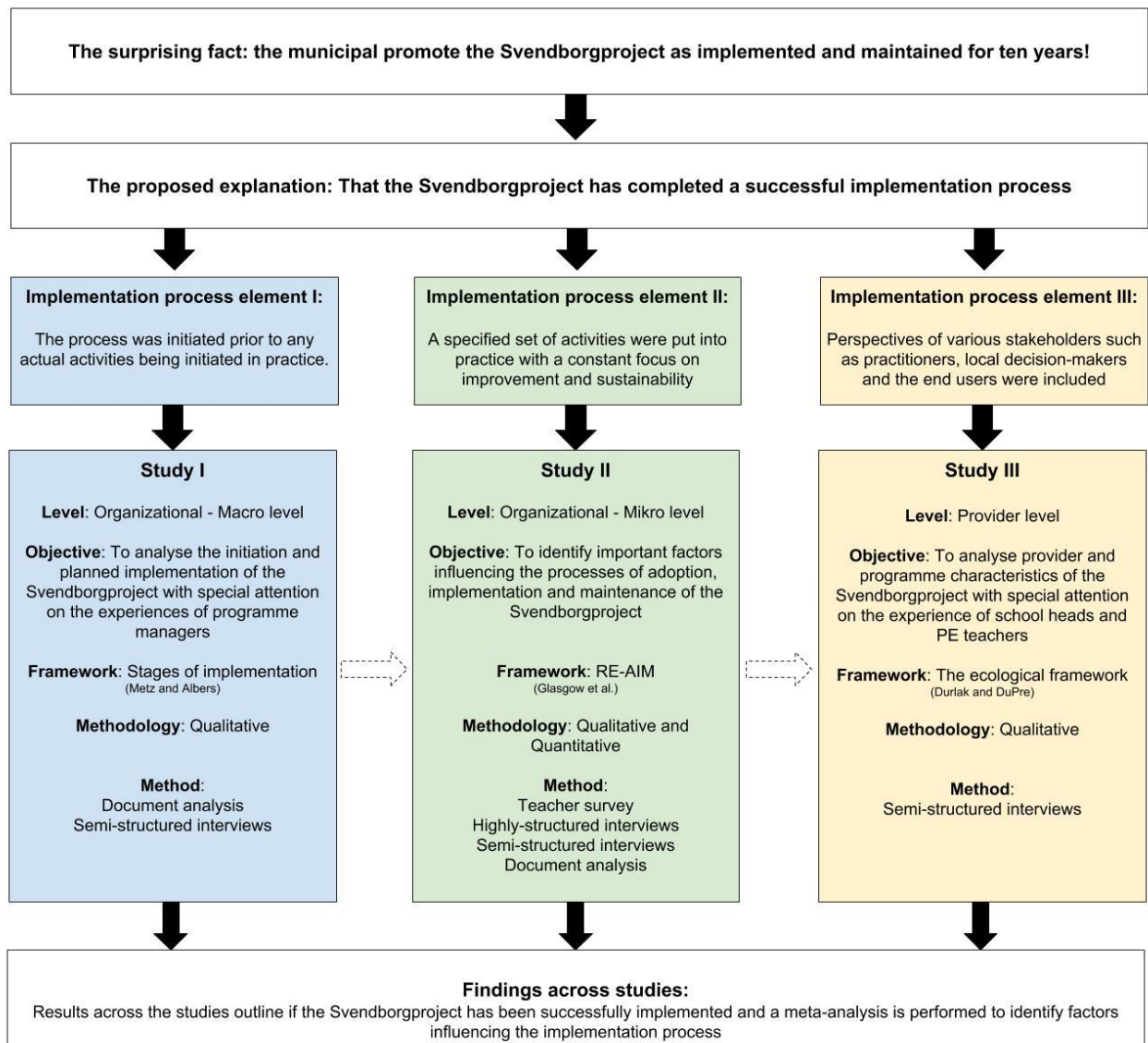
2.4.3 The use of frameworks

Due to the thesis' reasoning through abduction, the logical inference is highly dependent on the PhD candidates' inherent knowledge in the field of implementation. Thus, three different implementation-

oriented frameworks were selected across the three studies to provide a strict focus on the individual implementation process element explored (Figure 6). Frameworks, such as the ones used, are set to hold a number of categories presuming to account for a specific phenomenon without providing an explanation for the phenomenon, nor drive any change mechanisms (Nilsen, 2015). Hereby, frameworks, as opposed to theories, only indicate where to look and what to look for, without providing explanations nor interrelations across these phenomenon's. Thus, based on the abductive approach in the thesis, the analysis is driven by empirical observations while the applied frameworks should be viewed as 'empty' tools denoting a structure, enabling and qualifying the exploration of the individual implementation process element.

The frameworks included in the thesis are; stages of implementation (Metz & Albers, 2014); RE-AIM (Glasgow, Vogt, & Boles, 1999); and The ecological framework (Durlak & DuPre, 2008). The argument for applying different frameworks, is made through the perspectives of pragmatism. Pragmatism states that solving the problem in question drives a scientific inquiry; it fixes the destination and frames the process by always arguing in relation to the specific problem (Dewey & Dewey, 1910; Charles S. Peirce, Houser, Kloesel, & Peirce Edition, 1992). Thus, the frameworks chosen should aid the objective of the individual study. The three frameworks all address general aspects of the implementation process, however, each of them also offers specific perspectives relating to each of the three implementation process elements in focus. For example, the stages of implementation framework is the only one that addresses the early activities of planning and preparation, while the ecological framework offers a specific focus on the provider perspective. Additionally, RE-AIM adds specific attention to adoption, implementation and maintenance, and has shown to be useful when exploring the implementation of school-based programmes. The following sections will present the three frameworks used in the three studies and their specific perspective relating to the individual implementation process element. Based on the focus on empirical observations the inclusion of the frameworks is limited to the individual study.

Figure 6: Visualization of the abductive inference process of the thesis, presenting the surprising fact, the proposed explanation, the three implementation process elements explored across the three studies and the final meta-analysis.

The surprising fact: the municipal promote the Svendborgproject as implemented and maintained for ten years!

The proposed explanation: That the Svendborgproject has completed a successful implementation process

Implementation process element I:

The process was initiated prior to any actual activities being initiated in practice.

Implementation process element II:

A specified set of activities were put into practice with a constant focus on improvement and sustainability

Implementation process element III:

Perspectives of various stakeholders such as practitioners, local decision-makers and the end users were included

Study I

Level: Organizational - Macro level

Objective: To analyse the initiation and planned implementation of the Svendborgproject with special attention on the experiences of programme managers

Framework: Stages of implementation
(Metz and Albers)

Methodology: Qualitative

Method:
Document analysis
Semi-structured interviews

Study II

Level: Organizational - Mikro level

Objective: To identify important factors influencing the processes of adoption, implementation and maintenance of the Svendborgproject

Framework: RE-AIM
(Glasgow et al.)

Methodology: Qualitative and Quantitative

Method:
Teacher survey
Highly-structured interviews
Semi-structured interviews
Document analysis

Study III

Level: Provider level

Objective: To analyse provider and programme characteristics of the Svendborgproject with special attention on the experience of school heads and PE teachers

Framework: The ecological framework
(Durlak and DuPre)

Methodology: Qualitative

Method:
Semi-structured interviews

Findings across studies:
Results across the studies outline if the Svendborgproject has been successfully implemented and a meta-analysis is performed to identify factors influencing the implementation process

2.4.3.1 Study I: Stages of implementation

The objective of the first study was to analyse the implementation process element regarding initiation and planned implementation of the Svendborgproject. This with special attention on the organizational-macro level through the experiences of programme managers. To guide the study a stage-based approach for implementation was adopted (Metz & Albers, 2014). The frameworks by Metz and Alberts is a determination framework describing implementation as a process occurring in a number of stages: i) a planning stage, ii) a preparation stage, iii) and an implementation, improvement and maintenance stage (Metz & Albers, 2014). These stages typically unfold over a number of years and typically include core functions at each stage. Special attention is directed at a number of preliminary steps prior to the actual activities being implemented in practice (Metz & Albers, 2014). These preliminary steps focus on the identification of potential barriers to the implementation process and are ideally facilitated during the planning stage (Metz & Albers, 2014). The work done in these preliminary steps is considered critical, as they can lead to challenges later on in the implementation process (Metz & Albers, 2014). Based on the insights of these early stages of the implementation process, the framework was deemed a fitting structure to fulfil the objective of the first study. Through the exploration of the planning and preparation phase adds to the abductive reasoning and determine if the proposed explanation can be suspected to be true - demanding that the Svendborgproject should hold such early implementation activities.

2.4.3.2 Study II: RE-AIM

The objective of the second study was to analyse the implementation process element of adoption, implementation and maintenance of the Svendborgproject. This with special attention on the change in school practice on the organizational-micro level and primarily explored through the experiences of school heads and supplied by teacher questionnaire fidelity scores and programme manager experiences. To guide the second study, the RE-AIM framework (Reach, Effectiveness, Adoption, Implementation and Maintenance) was adopted (Glasgow, Vogt, & Boles, 1999). In their introduction of the framework, Glasgow et al. argue that, while reach and efficacy might define the impact of a

programme, additional attention should be directed at the adoption, implementation and maintenance dimensions in order to enhance the possible translation and dissemination of programmes (Glasgow, Vogt, & Boles, 1999).

Initially, the adoption dimension relates to the commitment of staff and implementation sites and their decision to install the programme (Glasgow, Vogt, & Boles, 1999; R. S. Kessler, Purcell, Glasgow, Klesges, et al., 2013). Secondly, the implementation dimension relates to the extent to which the programme is implemented as intended (fidelity), while also addressing adaptations made to the programme (Glasgow, Vogt, & Boles, 1999; R. S. Kessler, et al., 2013). Finally, maintenance relates to the extent to which the elements of the programme as implemented were maintained over time and the programme's ability to become an integrated part of the schools' daily practice (Glasgow, Vogt, & Boles, 1999; R. S. Kessler, et al., 2013).

The RE-AIM framework is a widely accepted framework and has already been shown to be useful in evaluating real-world programmes with special focus on the adoption, implementation and maintenance of new practices in a school context (Austin, Bell, Caperchione, & Mummery, 2011; P. Estabrooks, Dzewaltowski, Glasgow, & Klesges, 2003; M. Janssen, Toussaint, van Mechelen, & Verhagen, 2013; Smedegaard, Brondeel, Christiansen, & Skovgaard, 2017).Thus, RE-AIM was assessed as fitting to fulfil the objective of the second study. Ultimately the RE-AIM framework provided a structure for the empirical observations of the implementation process element of adoption, implementation and maintenance. Thus, it was assessed to fit the objective of the second study and add to the abductive reasoning - determine if the Svendborgproject contained the needed implementation process element for the proposed explanation to be true.

2.4.3.3 Study III: The ecological framework

The objective of the third study was to analyse the implementation process element of provider and programme characteristics of the Svendborgproject. This with special attention on the provider-level through experience of school heads and PE teachers. In order to guide the study, parts of Durlak and DuPre's ecological framework was used (Durlak & DuPre, 2008). In their ecological framework, Durlak and DuPre describe five domains that affect the implementation process: the providers, the programme, the community, the support system and the organization (Durlak & DuPre, 2008).

Both the provider and programme domain have also been mentioned by others as important aspects in the investigation of the implementation and dissemination of programmes (Greenhalgh, et al., 2004; Maria Ingemarson, Bodin, Rubenson, & Guldbrandsson, 2016; Rogers, 2003; Wandersman, et al., 2008). It has even been proposed that the providers 'are the programme' (D. L. Fixsen, Blase, Naoom, & Wallace, 2009) and that the characteristics both of the providers adopting the practice and of the programme itself are associated with barriers and incentives and affect programme's implementation and maintenance (Durlak & DuPre, 2008; Greenhalgh, et al., 2004; Maria Ingemarson, Bodin, Rubenson, & Guldbrandsson, 2016; Ogden & Fixsen, 2014; Rogers, 2003; Wandersman, et al., 2008). Analysing the programme's compatibility with the basic views, the practices and the local context of providers is, then, an important element in the evaluation of school-based programmes.

The ecological framework addresses the provider domain as the characteristics of providers of a given programme in relation to their perceived need for and benefit of that programme. Additionally, emphasis is placed on the providers' perceived ability to deliver the programme in a given context and on their proficiency. Programme characteristics relate to the programme's fit to existing practice and to the priorities of a specified setting, whereas adaptability concerns a programme's ability to be modified to fit local needs. Thus, the provider and programme domain of Durlak and DuPre's ecological framework was assessed as fitting to fulfil the objective of the third study. The framework was

considered to hold a suitable structure to fulfil the objective of the third study. Based on the insights of the main providers of the Svendborgproject, it is possible to add to the abductive inference, by exploring if the programme holds the last of the proposed implementation process elements - demanding that the Svendborgproject has included the perspectives of various stakeholders such as practitioners and local decision-makers.

3. Methodology

The thesis uses a qualitative dominant embedded mixed method design. An overview of the mixed methods characteristics of the thesis is presented in Table 2 while the following sections of this chapter will clarify the use of an embedded mixed methods design. In the use of mixed methods, the thesis adopts Johnson et al. definition of mixed methods as "*the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration*" *(Johnson, Onwuegbuzie, & Turner, 2007)*. This definition opens a qualitative-quantitative continuum in which several subtypes of mixed methods approaches occur and three major mixed methods research paradigms are established; i) qualitative dominant, ii) equal status and iii) quantitative dominant (Figure 7) (Johnson, Onwuegbuzie, & Turner, 2007). Initially, before clarifying the actual design of the thesis, arguments will be presented on the links between mixed methods and pragmatism as the adopted scientific theoretical approach. Subsequently, the use of the embedded mixed methods design will be presented through a presentation of its purpose as well as the independence, the status and the implementation timing of the methods applied in the thesis.

Table 1: Overview of the mixed methods characteristics of the thesis, adapted from Greene et al.

(Greene, Caracelli, & Graham, 1989)

Mixed method characteristic	In the thesis
Paradigm:	Pragmatic
Logic of inference	Strict abduction
Phenomena:	Implementation of the Svendborgproject
Design:	Embedded design
Purpose:	Complementary
Implementation timing:	Concurrent
Implementation independence:	Interactively
Status:	Primary qualitative
Integrative task:	Joint analysis

Figure 7: Illustration of the qualitative-quantitative continuum in mixed methods, including the three major mixed method research paradigms and subtypes adapted from Johnson et al. (Johnson, Onwuegbuzie, & Turner, 2007)
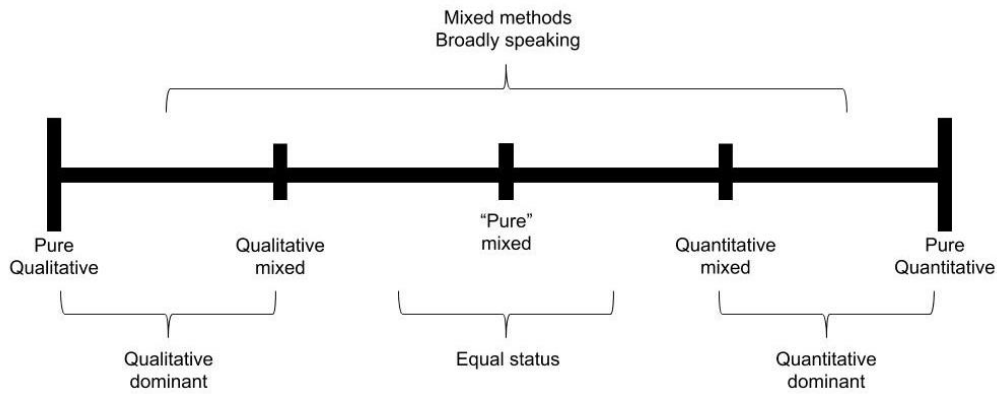
3.1 Mixed methods and pragmatism

As a rule, pragmatism would argue that the combination of various methods from different research fields can be a productive and meaningful way to solve the problems at hand (Johnson & Onwuegbuzie, 2004; Morgan, 2007). In many cases this involves a combination of both quantitative and qualitative methods in the aim of producing better solutions and superior products (Johnson & Onwuegbuzie, 2004). Pragmatism has been stressed as a philosophical tradition that offers a useful middle position to build a bridge between qualitative and quantitate research (Denscombe, 2008; Greene, 2007e; Johnson & Onwuegbuzie, 2004; Morgan, 2007). This has resulted in an mixed methods translation of the pragmatic stance "*Choose the combination or mixture of methods and procedures that works best for answering your research question*" (Johnson & Onwuegbuzie, 2004). Thus, the use of mixed methods aligns with the scientific theoretical approach of the thesis. In the following the purpose of applying a mixed method design in the thesis will be present.

3.1.1 The purpose of the mixed methods design

In the present thesis, the purpose of applying mixed methods is one of complementarity. Through a complimentary purpose the thesis seeks to establish a broader, deeper and more comprehensive understanding of the implementation of the Svendborgproject. In general, mixed methods have been advocated in the field of implementation as a beneficial way to assess contextual factors and identify conditions that influence programme success (Glasgow & Emmons, 2007; Harden, Smith, Ory, Smith-Ray, et al., 2018; R. Kessler & Glasgow, 2011; Aarons, Fettes, Sommerfeld, & Palinkas, 2012). The key aspect of the complimentary mixed methods purpose is that the various methods applied all focus on the same phenomenon. However, the methods are intentionally designed to tap into different aspects to gain a greater understanding of the phenomenon under investigation (Greene, 2007a). Hereby, the mixing of both qualitative and quantitative methods is established in the aim of elaborating and clarifying the results from one method with results from another (Greene, 2007d). This is operationalized throughout the three studies in the thesis, using various methods and objectives to gain a greater understanding of the change mechanism influencing the implementation of the Svendborgproject (Figure 5, page 29).

3.1.2 The dimensions of the mixed methods design

Three important dimensions to consider when applying a mixed-methods design is the methods level of independence, their status and the implementation timing of the various methods used. Independence addresses whether the methods are implemented independently from one another or if the methods are implemented as interacting throughout the course of study. The status of the methods addresses whether the methods are equally important or one is set as the primary and implementation timing addresses the sequencing in which the methods is applied (Greene, 2007a).

In the thesis, the various methods applied are implemented interactively with semi-structured interviews as the primary method. In alignment with the pragmatic perspective of the thesis, special

attention is set on practical experiences and contextual factors influencing the implementation process of the Svendborgproject (Greene, 2007e). Semi-structured interviews are set as the primary method, as one of the strengths of the method is to explore in-depth understandings and human experiences in all its complexity (Brinkmann & Tanggaard, 2015; Greene, 2007b; Kelly, 2010). By applying interviews as the main method, the implementation process is explored through detailed perspectives and experiences of main actors on the organizational macro (programme managers), organizational micro (school heads) and provider level (PE teachers). Hereby the thesis adopts a qualitative dominant mixed method design (Figure 7, page 45), while incorporating quantitative approaches, as it is recognized, that they will help elaborate and clarify the qualitative results (Johnson, Onwuegbuzie, & Turner, 2007). For example, questionnaires are an embedded method providing a quantitative measure through the identification of the fidelity of the programme. The embedding of methods implies that the secondary methods feed into and adheres to key parameters of the primary method – e.g. the designing of the questionnaire is assign to the interview findings, indicating the core requirements of the programme on which fidelity should be measured (Greene, 2007a). Furthermore, methods are implemented through a concurrent sequence. Concurrent sequencing involves at least two relatively independent method strands of data collection and analysis strategies. Only once the results have been produced for each of the strands, the strands are synthesized into a meta-inference in the end of a study (Figure 8) (Teddlie & Tashakkori, 2006). For instance, PE questionnaires represent a quantitative strand used to determine the implementation degree of the Svendborgproject and semi-structured interviews a qualitative strand used to provide a deeper understanding of the implementation process.

Figure 8: Visualization of a concurrent mixed methods approach, adapted from Teddlie and Tashakkori (Teddlie & Tashakkori, 2006)
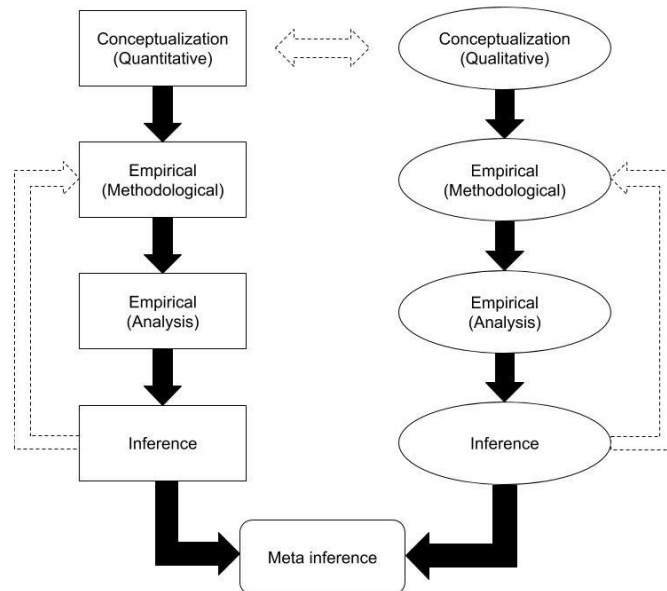
3.1.3 The embedded mixed methods design

The embedded mixed methods design involves the embedding of one or more supplementary methods in the primary method used. The embedded mixed methods design is visualized in Figure 9. A distinctive part of the embedded design is, that the supplementary methods follows the key parameters of the primary method, including sampling and the overall design. Across the three studies included in the thesis, semi-structured interviews are the primary source in which the other methods are embedded. Thus, primary weight will be put on the empirical data from semi-structured interviews in the conclusions drawn.

Figure 9: Visualization of the embedded mixed methods design of the thesis, setting semi-structured interviews as the primary method and highly-structured interview, questionnaires and document analysis as the embedded methods, adapted from Plano Clark et al. (Plano Clark, Huddleston-Casas, Churchill, O'Neil Green, et al., 2008)
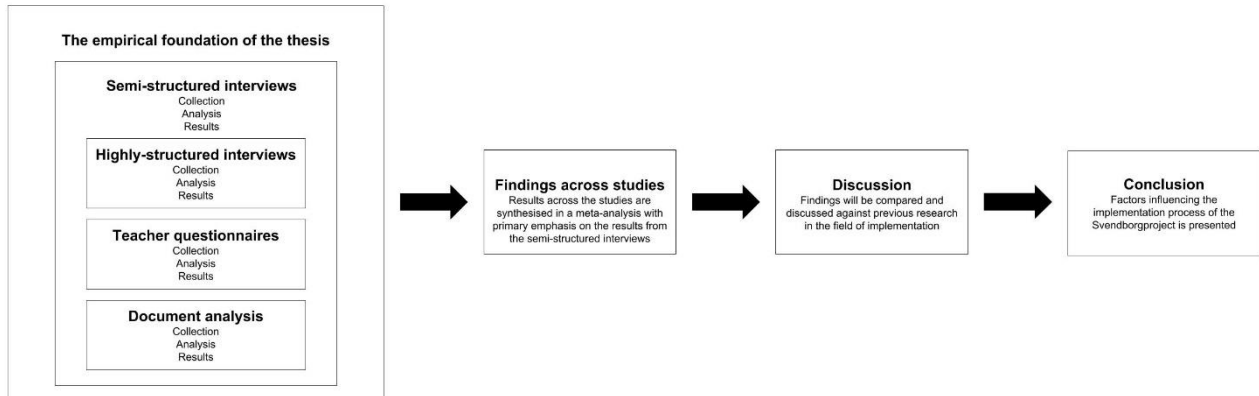
4. Methods

In this section the various methods used in the thesis are presented in overall terms with a main perspective on why and how these methods were used for data collection. For a more detailed description of the individual methods applied in the thesis, please see paper I-III. Table 3 shows the various data-sources applied in the thesis, the time data was collection and how the various data-sources inform on each of the three studies.

Table 2: Description of the various data-sources applied in the thesis, the time data was collection and how the various data-sources inform on each of the three studies

Data sources	Data collection period	Study I	Study II	Study III
Semi-structured group interviews with programme managers (N=2)	2015	X	X	
Semi-structured single interviews with sitting school heads (N=6)	2016-17		X	X
Highly-structured single interviews with sitting school heads (N=6)	2016-17		X	
Semi-structured group interviews with PE teachers (N=3)	2016-17			X
PE teacher questionnaires	2016		X	
Programme-related documents - school strategy reports (N=5) - internal evaluations (N=2) - collaboration minutes (N=21)	2014	X	X	

4.1 Interviews

Semi-structed interviews was the primary methods used to gain insight of the implementation process from both programme managers, school management and PE teachers. In all interviews purposeful sampling of key informants was used to create a pool of respondents who were most likely to have accumulated detailed insight into the programme over prolonged periods of time (Kelly, 2010). In relation to the application of strict abductive, the interview-guides were driven by the implementation process elements of a successful implementation process (section 1.2, page 15). In addition, perspectives from the applied frameworks, used across the three studies, were incorporated to guide questions on mechanisms that could be important in relation to the individual implementation process element. As presented in Table 3 both programme manager and school head interviews were used in more than one study, thus, the interview guides incorporated questions based on two different frameworks. For example, in programme manager interviews, the stages of implementation framework added attention on the preliminary steps through the question 'What led to the initiation of the Svendborgproject and what enabled it?' and the RE-AIM framework added attention on maintenance through the question 'Are you aware of any threats that could affect the survival of the Svendborgproject?'. Another example of how the frameworks guided the questions was in PE teacher interviews, where the ecological framework added attention on providers perceived need for the programme through the question 'Did you have any possible benefits in mind when the programme was initiated?'.

All questions in the interview-guide were framed in an open-ended manner within the context of the programme and were based on the language and terms presented in the programme documents. The application of semi-structured interviews and open-ended questions ensured that large parts of the interview were driven by the respondents' experiences and allowed the interviewer to follow interesting elements that arose during the interview. Hereby, the semi structured interviews were able to explore implementation aspects beyond the individual framework used in the developing of the interview guide. This aligns with the pragmatic position of the thesis, promoting practical experiences

and only the use of frameworks and theories as useful based on their predictability and applicability (Johnson & Onwuegbuzie, 2004).

4.1.1 Programme managers

Programme managers represents the organizational macro level. Two group interviews with three municipal programme managers were conducted. Respondents were chosen from those programme managers who had been employed during the initial years of the programme. Programme managers were chosen as they have not only been disseminating strategies and guidelines to schools and other stakeholders but have also been in close dialogue with each school and gathered information from all stakeholders in the programme. Thus, programme managers had in-depth knowledge and insight of the preparation, planning and implementation stages. Five programme managers met this criterion and three of these were invited to participate. Two were still working on the programme, while the third, who was considered to be the founder of the programme, was no longer attached to the municipality. The two programme managers not included in the study sample had only been temporarily involved in the programme. Programme managers were interviewed due to their efforts to disseminate the programme through strategies and guidelines to participating schools as well as their close dialogue with each school throughout the implementation process. Semi-structured group interviews were chosen, as it was deemed that the interviewees could support each other in recollecting the process since programme start-up in 2008. Following the first interview, the data were analysed and a second interview with the same three programme managers were performed. By promoting elaborations and clarifying unclear descriptions or uncertainties, the second interview sought to increase the depth and credibility of the information gathered in the first interview. After the second interview data revealed overlaps between information from the two interviews. Based on the successful sampling of all programme promoters assessed to hold relevant insight, it was deemed, that the possible amount of information on the implementation process on the organizational macro level was reached. Each of the group interview lasted approximately 90 minutes.

4.1.2 School heads

School heads represents both the organizational micro and the provider level. Six single semi-structured interviews with school heads were conducted. Twelve former and current school heads and deputy heads were identified, some were retired, and some had moved to another school. Of the twelve, seven were highlighted as most likely to yield relevant and useful information due to their current or former engagement to the programme and invited to participate. In some cases, deputy heads were chosen to take part, if they were assessed to have better insight into the programme and the implementation process than the head of their school. Of the seven heads invited, six agreed to participate, while the seventh declined due to lack of time. Two of the participants had been involved in the programme since initiation in 2008. One was positioned as school head while the other occupied a post as deputy head – neither had changed position or school since the start of the programme. The remaining four participants had been school head during the programmes initiation in 2008. Of these four, one had retired, two had moved to another school in Svendborg while the last one had moved to a school in another municipality.

School heads were interviewed individually, as they represented different schools, and could each provide different perspectives and nuances of the implementation process. Initially a short highly-structured interview (approximately 10 minutes) was performed to determine to what degree programme elements were delivered as designed (fidelity). The highly-structured questions were sent to the respondents prior to the interview. Immediately after the highly-structured interview, a 45-minute semi-structured interview was conducted to cover the process of adopting, implementing and maintaining the programme. The two interview methods were combined in a single visit in order to minimize disruption for the respondents and to allow the highly-structured interview to provide a basis for the subsequent semi-structured interview. Initially, four school heads from different schools were interviewed and analysed. However, in order to improve data saturation and representativeness of all

the six original schools in the Svendborgproject, interviews with two school heads, from the schools not represented in the first interview round, were conducted.

4.1.3 PE teachers

PE teachers represents the provider level. Three 60-minute semi-structured group interviews with six PE teachers (two teachers in each interview) were conducted across three different schools. PE teachers that had acted as programme promoters across the six schools were mainly targeted as potential respondents. Programme promoters were targeted due to their in-depth understanding of the programme and broad insight of the implementation process on their individual school. To identify current and former promoters as well as additional personnel relevant for interviewing, school heads were asked to identify teaching personnel with detailed knowledge of the programme. Only two school heads provided contact information on relevant teacher personnel, resulting in two teacher group interviews across the two schools. The additional school heads mainly argued that the school and teachers were too busy at the time. Subsequently to analysing the interviews two school heads were contacted once more in order to recruit teachers and strengthen the empirical foundation. One school head responded and provided two relevant teachers for a third interview. Thus, six PE teachers (one was a pedagogue who also taught PE and had attended the ATC course) across three of the participating schools were interviewed. Although more teachers were wanted for the interviews, the recruitment process showed some difficulties due to business at the schools. However, the interviewed PE teachers all provided rich in-depth knowledge with reasonable saturation.

4.2 Documents

Documents informs both the organizational macro and micro level. Programme documents dating back to the initial programme planning period were collected. All retrieved documents form part of the public record and can be sorted into five categories: 1) city council minutes outlining the initial programme plan, as it was presented and subsequently approved by local political committees and councils; 2)

collaboration minutes describing the joint implementation process of programme managers and schools; 3) information material on programme content that were produced by the programme managers and contained information on core content and what being part of the Svendborgproject involved; 4) internal evaluations of the implementation process and an evaluation collating experiences from all participant schools on how to implement the programme; 5) individual school strategy reports describing how each school implemented the programme during the initial years. Altogether, documents provided experiences covering the period of 2008-2016 and contained valuable information on programmes characteristics and the implementation process. Due to the retrospective perspective of the thesis, the information the documents provided were valued an important complimentary data source to the interviews.

4.3 Questionnaires

Questionnaires represents the organizational micro and the provider level. A questionnaire with the main purpose of determining the degree of which programme requirements and highly-recommended elements were delivered as designed (fidelity) was developed. The questionnaire was designed to measure both implementation fidelity and maintenance fidelity based on a list of identified programme elements and implementation strategies from the interviews and documents. The list was developed through analysis of programme manager interviews and programme documents and was approved to comprise fidelity of the programme by the sitting programme managers. In order to strengthen the content validity of the questionnaire, it was initially reviewed by two colleagues, who had in-depth knowledge of the Svendborgproject. Secondly programme managers were asked to review all questions in relation to their ability to capture programme fidelity as they had detailed knowledge of programme content and structure. The questionnaire was also adapted to the target group by having two PE teachers correct any ambiguous or difficult questions. The two PE teachers had no connection to the programme and were solely involved to ensure that the questions were phrased to fit the target group, thereby making it more likely for PE teachers to understand and answer the questions.

Implementation fidelity covered the required programme elements as in 2011, measuring i) if the pupils in pre-school to sixth grade received 4.5 hours of PE distributed across a minimum of three days, ii) if PE teachers had participated in the professional development course and iii) if the schools had a programme promoter (school staff member). The two highly recommended programme elements were also measured included; i) if programme promoters participate in collaboration meetings with programme managers and promoters from other schools, and ii) if PE teachers planed a portion of their lessons as outdoor PE.

In order to measure implementation fidelity, participants were asked to remember, to what extend they had implemented programme requirements in 2011. Fidelity was measured as in 2011 in order to align the implementation status with the quantitative strand of the CHAMPS-study DK. This in order to strengthen the link between programme activities and the established health outcomes. Maintenance fidelity covered the current status of the programme (collected in 2016), measuring the original three required and recommended programme elements as well as the two new programme elements added to the programme in 2012 (Figure 3, page 25); i) if three hours of the additional PE included ATC-related content and; ii) if pupils got 20 minutes of high intensity activity in each PE session. The maintenance part of the questionnaire also contained questions regarding PE teachers' perception on working at a school taking part in the Svendborgproject.

Across the six schools 46 PE teachers were identified. Of these, 35 (76%) answered the questionnaire, all reporting on maintenance fidelity (fidelity as in 2016). No information could be retrieved regarding who or how many PE teachers that were employed at the wanted measure point of implementation fidelity (fidelity as in 2011). Thus, based on employment information given in the questionnaire regarding maintenance, PE teachers were invited to answer questions on implementation fidelity in continuance to the maintenance part of the questionnaire. The only teachers invited to answer questions relating to the implementation fidelity were those reporting that they were employed at a school in the Svendborgproject and had been teaching PE during the implementation fidelity measuring point in

2011. There were 23 teachers who fitted this criterion and who answered the questions regarding implementation fidelity. Due to the lack of information on the number of PE teachers employed in 2011 and the recruitment through the questionnaire, no response rate regarding implementation fidelity can be presented. Both answers on implementation and maintenance were equal distributed across the six schools. A flowchart of the collection of questionnaire data across schools is shown in Figure10.

Figure 10: Flowchart of the collection of questionnaire data across schools
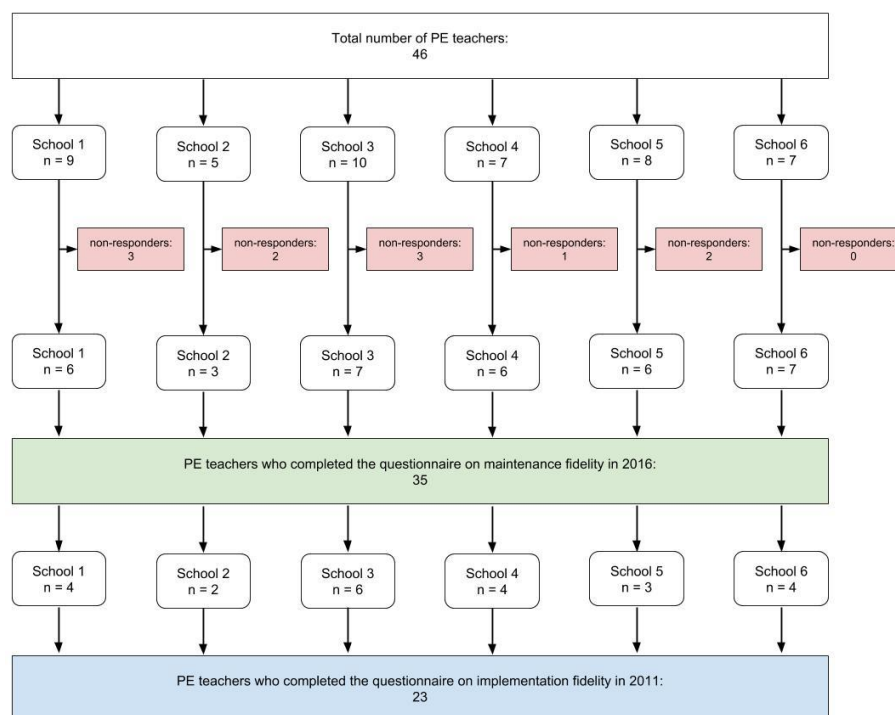
4.4 Analysis strategies

The analysis was conducted in two steps. Initially data were analysed in the three studies – Table 3 shows how the various data-sources inform on each of the three studies (section 4, page 48). This first step was part of the strict abductive approach, exploring three different implementation process elements in order to outline if the Svendborgproject had undergone a successfully implementation process (section 1.2, page 15). In the second step, a meta-analysis was performed across the three

studies to identify factors influencing the implementation process. Both these steps are presented in the following.

4.4.1 Analysis in the studies

Both document and semi-structured interview data were analysed using qualitative content analysis (Schreier, 2014). Ultimately this implies a systematic description of the empirical data through coding. Initially, both interviews and documents were thoroughly familiarized prior to the coding of the material. This familiarization was done by reading the material while taking notes. Then a coding-frame was constructed, holding a set of categories and subcategories. The categories represented overall aspects of the material on which information is sought, while subcategories represent what was said in the empirical data in relation to the individual category (Schreier, 2014). The applied frameworks (section 2.4.3, page 38) provided the categories of the coding-frame as they were presumed to account for the specific implementation process element explored (Figure 6, page 39). For example, in the second study the RE-AIM framework was used, providing the overall categories of adoption, implementation and maintenance. Subcategories were created based on a data-driven analysis, identifying patterns in the empirical data in relation to the categories. Subsequently, a large portion of both the document and interview data were trial-coded according to the coding-frame. The results from the trial-coding were discussed among the other authors in order to adjust and refine the coding-frame. Next, all data that had been used in the trial-coding were re-coded with the new coding-frame together with the rest of the interview and document data. In the final step of the analysis, coded material was thoroughly read, and main quotations were selected to illustrate the meaning of the codes and give insight to the empirical data on which the conclusions were drawn.

STATAv15 was used to handle questionnaire data. Due to the paucity of responses, the value "partially agree" was collapsed with the value "agree", and the value "partially disagree" were collapsed with the value "disagree". Thus, three categories were used in the implementation and maintenance fidelity

analysis: i) agree, ii) disagree and iii) do not know. Descriptive statistics and proportions on implementation and maintenance fidelity were produced and then compared to fidelity information drawn from the highly-structured interviews and documents.

4.4.2 Meta-analysis across the studies

In this second step of the analysis, the empirical knowledge gathered across the three studies were synthesised in a meta-analysis. The aim was to 'go beyond' the individual content of the three studies. This was done through the strategy of 'thematic synthesis', analysing the results across the three studies (Thomas & Harden, 2008; Timulak, 2014). The analysis was driven by the aim of the thesis, providing a structure within which it became possible to develop a higher order of thematic categories (Thomas & Harden, 2008). Initially this was done by coding the results across the three studies in relation to the aim – identifying factors influencing the implementation process. Then the codes were compared looking for similarities and differences in order to group them under an overreaching theme. Through this process new insights on the implementation process emerged and important factors influencing the implementation process occurred.

4.5 Ethical considerations

Written informed consent, also containing consent for publication, was collected from all participants at the beginning of each interview. Through the informed consent-form respondents were informed that; their participation was voluntary and that they could withdraw their consent for participation at any time; that all interview and questionnaire data was stored and treated in accordance to the Danish data-protection laws; that the respondents name, all school names and names of other persons mentioned in the interviews would be anonymized; that the anonymization would be done both in the data and the presentations of analysis; that parts of the interview could be used for quotes in the presentation of analysis yet still anonymized. Before the interview, a short verbal presentation of the content-form was also given along with the possibility for the interviewer to elaborate the point in the

consent form, if the respondent felt the need. Regarding the questionnaire all personally identifiable information was anonymized both in the data and the presentations of analysis. The programme of research was approved by the Danish Research Ethics Committee (Project-ID: S-20080047 and S-20140105).

5. Findings across studies

The three studies confirms that the Svendborgproject holds the proposed elements of a successful implementation process; Paper I) including planning activities prior to any actual activities being initiated in practice, Paper II) including a specified set of activities adopted and implemented in practice with a constant focus on improvement and maintenance and Paper III) including perspectives of various stakeholders such as practitioners and local decision-makers(Nielsen, Bredahl, Bugge, Klakk, et al., 2019 [In review]). For a more detailed description of the results of the individual studies please see paper I-III at the end of the thesis. The purpose of this section is to present the findings of the meta-analysis, synthesising the collective knowledge across studies, directing the attention on relevant factors influencing the implementation process of the Svendborgproject. Four main factors were found; i) alignment with existing values and priorities; ii) Combining a top-down and bottom-up approach; iii) Having a professional development course; iiii) Enabling adaptations. In the following these factors are presented.

5.1 Alignment with existing values and priorities

The Svendborgproject has managed to account for contextual values and priorities between at the individual schools. Initially this was realised through the invitation for all nineteen schools in the municipality of Svendborg, asking if they were interested in participating in a programme focusing on increasing the amount of PE. Programme managers, PE teachers and school heads all reported that the six schools that became part of the programme found PA and PE a meaningful element and something that was already a part of the schools individual set of values before initiation of the Svendborgproject (Paper I, Paper II and Paper III). Both PE teachers and heads elaborated that the alignment with school values included the inclusion of all pupils no matter their skill level as well as schools perceiving movement as an educational tool that could be used to aid social cohesion and self-confidence in their pupils. In relation, PE teachers and heads concluded that the programme especially has been beneficial

for the pupils that were insecure in relation to movement and sports. Teachers emphasised that the added amount of PE resulted in more time for introduction of the individual sports, ensuring that all pupils had the opportunity to master the needed skills (Paper III).

> *A child's first communication is through their body... so, it is very*
> *important that they know how to interact with each other physically... if*
> *you are not able to kick a ball or are in the way all the time, then you are*
> *put on the bench and getting marginalized already from a young age... I*
> *think it means the world that they learn how to use their bodies, and enjoy*
> *using them in play with others... [School 3 – School head]*

The school heads and PE teachers found it motivating to have the researchers following the children and documenting whether the programme and their PE lessons were effective (Paper II and Paper III). Furthermore, teacher questionnaires indicate that PE teachers were pleased that their school was committed to being part of the programme (Paper II). However, school heads and PE teachers stated that many non-PE teachers initially were concerned that the participation in the programme could undermine their individual subjects. This was a concern represented across all the six school and even though the added amount of PE were implemented as additional lessons to the existing schedule, not replacing other subjects, school heads had to be aware not to under-prioritize other subject and find a balance favouring the whole school (Paper II and Paper III). Still, both PE teachers and school heads state that although their school prioritized PE and PA prior to the initiation of the programme, the connection to the programme boosted their prioritization of PE and PA and anchored it as a part of the schools' everyday structure (Paper II and Paper III).

> *It [the Svendborgproject] has become grounded in our set of values... I*
> *would argue that if we suddenly no longer were part of the programme...*

well I think it would be like "we are not a part of the programme anymore

- no, but we ARE continuing this"… [School 1 – School head]

5.2 Combining a top-down and bottom-up approach

The Svendborgproject was based on a partnership between the programme managers, representing the municipal administration, and the participating schools. The partnership was grounded in a vision to combine programme managers top-down decisions through clear programme requirements and providers bottom-up involvement on how to implement programme requirements into everyday school practice; adding three times the amount of PE, assigning a programme promoter at the school and having PE teachers attend a professional development course. This approach has been highlighted by both programme managers, PE teachers and school heads as a very important element aiding the implementation process and ensured maintenance (Paper I, Paper II and Paper III).

It must not be top-down all the way… the frame is the top-down decision,

whereas the content and the implementation of it is bottom-up… we were

invited to develop the content… They [programme managers] were like;

there is a frame [programme requirements] and we do not want to discuss

it, however, we would like to discuss how it could be implemented, how

you want to do it at your school… [School 1 – School head]

As part of this bottom-up involvement providers from schools who chose to become part of the programme, were invited to help develop programme content and implementation strategies. Although the programme aligned with schools' general values and priorities, providers were sceptical regarding practicalities (Paper I and Paper II). Initially the providers addressed whether they would have enough space in the gym, would need additional equipment or if time could be allocated for the additional PE. However, providers became highly committed to the programme once they realised how the added

amount of PE could be implemented, bringing greater attention to pupils with difficulties through more time to focus on a learning perspective and go beyond just doing activities (Paper I).

It was a required condition that we had those more or less frustrating talks about what this programme implied and what it should contain… because we did not define the programme in advance… we were supposed to develop it together [with school representatives]… You have to be patient in that process… because you are developing a mutual basis and a shared language to speak from… [Programme manager 3]

To uphold the combination of top-down and bottom-up decisions, each school selected a programme promoter, to strengthen the link between the overall programme and the individual schools. This included participation in collaboration meetings with programme managers and the promoters from the other schools. This aided the flow of information from schools to programme managers and vice versa (Paper I and Paper II). The collaboration meetings also served as constant reminder that the school were part of the programme, and that requirements were attached (Paper II and Paper III). Programme managers, PE teachers and school heads point to this partnership process as a key component in the successful implementation and maintenance of the programme at both school and municipality level (Paper I, Paper II and Paper III).

The current meeting structure has been evaluated… all existing networks are stopped [including the collaboration network in the Svendborgproject]… Teacher from school 3 highlights that the collaboration network in the Svendborgproject has its own unique history. It provides central updates, knowledge and discussion aiding the schools work with the programme… The coming school year will continue

> *to bring challenges and it is agreed that the collaboration network will*
>
> *continue… [Document – collaboration minute, June 2014]*

This combined top-down and bottom-up approach has also been applied at the school-level as school heads have been the top-down decision-makers securing that core programme requirements were implemented at the school – scheduling the additional PE, appointing a programme promoter and deciding when the PE teachers could attend the mandatory professional development course (Paper II and Paper III). However, school heads stressed that the backing from school personnel and feedback from programme promoters has enabled their ability to make the changes needed to uphold programme requirements. Hereby the commitment of PE teachers has been an important driver to ensures progression and maintenance of the programme on the individual schools (Paper II and Paper III).

> *You need some physical education teachers who finds value in the*
>
> *programme… who are dedicated and can see the possibilities of it … the*
>
> *teachers' involvement is the most important… [School 4 – School head]*

5.3 Having a professional development course

The implementation of the Svendborgproject was aided by having a professional development course, assisting PE teachers with new teaching methods and new ways to organize the added amount of PE. The participation in the course was mandatory for PE teachers. The professional development course was initiated through a collaboration between the municipality of Svendborg, University College Lillebaelt (the institution educating teachers) and Team Denmark. The initial course setting worked as a pilot-project meant to adjust the course to the school practice at the participating schools. Through this pilot-period, PE teachers (mainly the ones chosen as programme promoters) and pedagogic personnel across all schools in the programme, were involved to try out theory and exercises. Furthermore, participants were given group assignments to reflection on how the programme could be

implemented on their school. This pilot-period ran from late-2008 to mid-2009 and contained 40 hours (divided across four modules).

Programme managers emphasised that the professional development courses not only should aid the implementation of the additional PE but also to ensure an increase in the professional quality of PE (Paper I). In general PE teachers were excited with participation in the course as it presented new ideas, perspectives and inspiration to practical exercises that could be used in the PE lessons (Paper II and Paper III). Even PE teachers reporting that they felt relative competent to handle the implementation of the additional PE, still benefited from attending the course, both gaining new skills and knowledge (Paper III). PE teachers in general reported that they gained new knowledge, partially due to the introduction to the ATC, but also through collaboration and knowledge exchange between teachers from different schools.

> *Teachers have gained new knowledge and been energized. It [the professional development course] have forced teachers to reflect on the content of their physical education lessons in a new way … The physical education lessons have changed significantly - the teachers have brought a lot of new knowledge to school… [Document – Internal evaluation, 2010]*

A part of the mandatory professional development course focused on practicability and how to organise the additional PE. This included the use of outdoor facilities by conducting PE in different seasons and weather conditions. The use of outdoor facilities supported the PE teachers in their planning in the event of the gym being occupied due to the general increase of PE at the schools (Paper I, Paper II and Paper III). This resulted in all schools arranging outdoor PE during all seasons.

There is also a module in the professional development course where [the teachers] learn how to use the available outdoor areas - because everyone can't use the gym at the same time. But how do we use this outside, for example, how do you use parkour in physical education, how to use all such things? So [the teachers] became more creative and got new ideas…
[Programme manager 3]

Although PE teacher participation in the course was a requirement when being part of the Svendborgproject, school heads revealed that this was an ongoing challenge (Paper II and Paper III). This was due to new PE teachers being appointed without having the necessary educational time to join the professional development courses.

5.4 Enabling adaptations

At initiation, programme managers acknowledged schools as autonomous partners and encouraged the schools to find their own particular way of implementing programme requirements (Paper I and Paper II). This allowed schools to adapt the programme to their individual local conditions such as available facilities, school size and surrounding areas (woods, lakes, urban areas etc.). All school heads and PE teachers recognized that although they fulfil the same programme requirements, they still had individual ways of being part of the programme (Paper II and Paper III).

I was part of the group focusing on how we should implement it [the programme] at our school… there were much attention on schools being allowed to adapt it to their individual culture… so of course it was something new, but we focused on what it would look like at our school… because the schools are very different… [School 3 – Teacher]

School adaptations resulted in different approaches to being part of the programme (Paper II and Paper III). Some schools, for instance, chose to split the 4.5 hours of PE over five days a week, and some chose to split the same amount of PE over three days a week. If schools had supplementary ideas, they were also encouraged to make additional initiatives as part of their involvement in the programme. Hence, some schools introducing cross-curricular lessons between PE and subjects like music (e.g. dancing and plying music), biology (e.g. PA in nearby nature environments while also learning about plants) or math (e.g. by jumping multiplication tables). Some schools also increased their general focus on conducting more lessons outside the classroom to promote PA, and some promoted active commuting to school (walking, cycling etc.).

> *We have very talented arts teachers, and we have very talented music teachers... Well, being part of the programme [the Svendborgproject], such subjects will be neglect a bit... However, these skills should still be used... so, we have combined movement and music... we've taken one of our six physical education lessons and simply call it dance... so we dance and through that we combine music and movement... [School 6 – School head]*

Although schools adapted the programme to their local context the basic programme requirements were still non-negotiable and had to be implemented. Document analysis, highly-structured school head interviews and PE teacher questionnaires revealed that despite these adaptations the original requirements of the Svendborgproject were still implemented and maintained with high fidelity (Table 4 and Table 5) (Paper II). PE teachers and school heads mark that the non-negotiable requirements established a frame in which the schools could develop their own implementation strategies and that this frame was an important tool to navigate and act accordingly (Paper III).

I also think it has been productive to have these non-negotiable elements

from the beginning… that there is something specific to hold on to… in the

long run you might find that things become more mixed, but I think it is

important to have a solid structure to start with … [School 3 - Teacher]

Table 3: Implementation fidelity of original requirements (2011)

Requirements	Reporting data source		
	Document analysis	**Highly- structured school head interviews**	**PE teacher questionnaires**
4.5 hour of PE minimum three days a week	All schools	All schools	21/23 teachers agree
PE teachers have participated in professional development course	-	-	22/23 teachers had participated
Schools have assigned a programme promoter	All schools	All schools	-
Highly recommended components			
Planning outdoor PE all year round	All schools	All schools	23/23 teachers agree
Programme promoters participate in collaboration minutes	All schools	All schools	-

Table 4: Maintenance fidelity of original requirements (2016)

Requirements	Reporting data source		
	Document analysis	**Highly- structured school head interviews**	**PE teacher questionnaires**
4.5 hour of PE minimum three days a week	All schools	All schools	30/35 teachers agree
PE teachers have participated in professional development course	-	-	26/35 teachers have participated
Schools have assigned a programme promoter	All schools	All schools	-
Highly recommended components			
Planning outdoor PE all year round	All schools	All schools	35/35 teachers agree
Programme promoters participate in collaboration minutes	All schools	All schools	-

Programme requirements were also adapted. After the first three years of the programme, programme managers and the participating schools conducted a systematic internal evaluation of the Svendborgproject, showing enthusiasm and positive feedback from all parties (Paper II). At the same time the municipality of Svendborg held a major conference promoting the programme and highlighting the research findings. Positive responses from participating schools alongside the research results showing the programme to be effective, dominated the discussion as to whether it was possible to include more schools in the programme (Paper II). Programme managers used this momentum to consolidate political support from the city council, which resulted in all schools in the municipality once again being invited to become part of the programme. All schools said yes. Both programme managers, school heads and PE teachers stress that the research results have given the programme legitimacy and political support allowing this adaptation and eventually resulting in the Svendborgproject progressing from being ad hoc funded to now having a robust economic base (Paper II and Paper III).

> *The connected research played a really important part in convincing the*
>
> *politicians that the Svendborgproject should be a continuing part of the*

municipality of Svendborg … with those positive research results it was

very difficult for the municipality NOT to continue… [School 5 – School

head]

Alongside the inclusion of the new schools, an adapted concept was introduced adding two new programme elements to the original three – i) three hours of the PE must include ATC-related content and ii) pupils should get 20 minutes of high intensity activity in each PE session. Programme manager interviews and documents reveal that these adaptations were very much based on feed-back from school promoters, who proposed more detailed descriptions for how the Svendborgproject should be adapted (Paper II). During this process, programme managers also consulted with the researchers and tried to adopt their recommendations in the new programme requirements.

We actually got feedback from some of the promoters at the schools

suggesting that the programme might have gotten a little diluted over

time… because in that first concept they [the requirements] were

described rather vaguely … So, they actually asked us to be more detailed

as regards the requirements of being part of the programme… we also

adopted the research results… and in this process… we found the new

concept… [Programme manager 3]

6. Discussion

The aim of the thesis was to identify important factors that have influenced the successful implementation process of the Svendborgproject. In this section, the main findings presented above will be interpreted and discussed in relation to previous research in the field of implementation. Subsequently, methodological reflections will be addressed to highlight strengths and limitations of the thesis.

6.1 Main findings in relation to previous research in the field

6.1.1 Alignment with existing values and priorities

The six schools choosing to participate in the Svendborgproject initially found value in the promotion of PA and PE. The experience of programme relevance to local needs has been pointed out as an advantage in securing implementation and maintenance of PA programmes, since it ensures that they will be better suited to the individual school context and schools already having an awareness of how to integrate PA (Durlak & DuPre, 2008; Forman, Olin, Hoagwood, Crowe, et al., 2008; M. Janssen, Toussaint, van Mechelen, & Verhagen, 2013; Nathan, Elton, Babic, McCarthy, et al., 2018; Naylor, et al., 2015; Pearson, et al., 2015). However, new programmes introduced to the school setting often raises concerns at the teacher level due to the additional work-load and the time required for implementation (Adamowitsch, Gugglberger, & Dur, 2017; Naylor, et al., 2015; Pearson, et al., 2015; Schuler, Saksvig, Nduka, Beckerman, et al., 2018). Teachers are also shown to be concerned that they have to down-prioritize academic goals in order to meet the requirements of new programmes (Keshavarz, Nutbeam, Rowling, & Khavarpour, 2010; Lytle, Ward, Nader, Pedersen, et al., 2003) and Clarke et al. found that this attention on academic achievements often results in down prioritizing of PA (Clarke, Fletcher, Lancashire, Pallan, et al., 2013). The results of the present study show that PE teachers did not share these concerns as the programme fitted the existing school priorities regarding PA and PE and actual resulted in teachers getting more time to teach PE. At the same time teachers were not asked to implement a specific content or theory in

their lessons, thus, they were able to align the programme with existing PE curricular. Such alignment with existing curricular has been highlighted as a facilitator for implementation (Bentsen, Bonde, Schneller, Danielsen, et al., 2018; Schuler, et al., 2018). Additionally, Bugge et al. found that being part of the Svendborgproject had no negative effects on the academic abilities of pupils (Bugge, et al., 2017). This indicates that time allocated to incorporate additional PE into the daily schedule can serve as a successful promotion of PA without schools having to make a trade-off between promotion of PA and upholding academic standards. Furthermore, the connected research through the CHAMPS-study DK, deemed the programme an effective health promotion initiative as it significantly improved the cardiovascular risk profile (i.e. insulin resistance and triglycerides) and lowered the risk of being overweight and obese for pupils at intervention schools compared to control schools (Klakk, et al., 2014; Klakk, et al., 2013). School heads and PE teachers deemed the programme relevant due to this promotion of physical health. In addition, both school heads and PE teachers stress that they observe increased competence, social skills and the development of fundamental movement skills, which are outcomes that others have associated with PE in school (Bailey, 2006). The findings of the thesis, suggest that a programme fitting existing school priorities and values may be an important factor in order to involve schools in the implementation of a programme in the first place – this is supported by others (McIsaac, Read, Veugelers, & Kirk, 2017; Sulz, Gibbons, Naylor, & Higginsb, 2016). However, this could imply implementation challenges when promoting health initiatives in schools without an initial prioritisation.

6.1.2 Combining a top-down and bottom-up approach

Programme managers in the Svendborgproject have been applying a mix of top-down leadership (ensuring that schools followed programme requirements) and a bottom-up involvement (allowing schools to find solutions that would fit their context). Applying such a combination of top-down and bottom-up approaches has promoted the knowledge dissemination in the programme which has been highlighted as an important factor to achieve successful implementation and increase the probability of

maintenance (McIsaac, Read, Veugelers, & Kirk, 2017; Ogden & Fixsen, 2014; Sulz, Gibbons, Naylor, & Higginsb, 2016). To promote a bottom-up approach, programme managers involved teacher representatives in the development of the programme in order to suit the programme to individual school practice. This early collaborative work between schools and programme managers, was perceived by all parties as a successful strategy for securing a contextual fit and a key factor in securing successful adoption, implementation and maintenance of the programme. This is supported by others reporting that early and continuous stakeholder involvement help programmes to fit existing school practice and increase the probability of adoption and maintenance (Durlak & DuPre, 2008; D. L. Fixsen, et al., 2005; Sulz, Gibbons, Naylor, & Higginsb, 2016). Programme managers, however, highlights that PE teachers initially showed scepticism when involved at this early stage. This could very well be due to the programme not being specific and clear enough about how it should be implemented which has shown important for teachers if they are to accept new programmes (Langille & Rodgers, 2010; Pearson, et al., 2015). The results from the Svendborgproject indicates that some scepticism can be expected in the early stages of a bottom-up approach until more specific implementation strategies are established. As the bottom-up inclusion in this early stage either can result in successful or failed adoption, programme managers need to find a balance between promoting autonomy and reducing complexity (Sulz, Gibbons, Naylor, & Higginsb, 2016). Thus, programme managers might have benefitted from applying a high degree of structure and clear guidelines, limiting the number of choices when including PE teachers in this early stages (Sulz, Gibbons, Naylor, & Higginsb, 2016).

Programme managers continued the bottom-up approach through regular collaboration meetings with school promoters from all schools. The collaboration meetings resulted in the sharing of experiences, knowledge and ideas on how to advance and maintain the programme. This is supported by others as beneficial strategies, as such collaboration partnership increases the opportunity to share and learn from the experiences of others and enhanced the sense of being part of a larger programme (Ogden & Fixsen, 2014; Sulz, Gibbons, Naylor, & Higginsb, 2016). Collaboration meetings also served as top-down

organizational support from programme managers which, in alignment with the results of others, both aided the adoption and the implementation of the programme (Durlak & DuPre, 2008). Furthermore, through these collaboration activities schools were reminded of the appertaining requirements which positively influenced maintenance. In addition, Griffin et al. found that a reminder of being part of a programme was desired by teachers in order to retain programmes into long-term change (Griffin, Clarke, Lancashire, Pallan, et al., 2015).

This combined top-down and bottom-up approach was also applied at the school-level through a co-dependant teamwork between school heads and PE teachers. Other studies often identify teachers as the key implementers, as they are the ones delivering a programme, often adoption a new focus in their existing lessons or developing new content (Bice, Brown, & Parry, 2014; Campbell, Rawlins, Wells, Kipping, et al., 2015; Hall, Schneider, Thompson, Volpe, et al., 2014; Howie, Brewer, Brown, Pfeiffer, et al., 2014; M. Janssen, Toussaint, van Mechelen, & Verhagen, 2013; Lytle, et al., 2003). However, the fairly simple programme requirements in the Svendborgproject only included requirements that school heads were able to implement. Thus, school heads can initially be identified as the key implementers of the programme, which presumably renders their dedication and support even more central to securing successful implementation and maintenance. The commitment and motivation of school heads has been noted as crucial for successful implementation (Forman, et al., 2008; M. Ingemarson, Rubenson, Bodin, & Guldbrandsson, 2014; Langille & Rodgers, 2010; Masse, Naiman, & Naylor, 2013; van Nassau, Singh, Broekhuizen, van Mechelen, et al., 2016), and is especially highlighted as important in the adoption of school-based programmes (M. Janssen, Toussaint, van Mechelen, & Verhagen, 2013; Langille & Rodgers, 2010; van Nassau, et al., 2016). However, school heads still emphasise the importance of having bottom-up support of PE teachers ensuring the maintenance of the implemented structures and the overall quality of the additional PE activities. Especially having assigned a programme promoter have been central through the entire process from initiation to maintenance. The value of bottom-up teacher support is in alignment with the experiences of others (Durlak & DuPre, 2008; Langille & Rodgers, 2010;

McIsaac, Read, Veugelers, & Kirk, 2017) and the results from the Svendborgproject imply that there has been co-dependant teamwork as neither school heads nor PE teachers could implement and maintain the preprogramme without the other. This co-dependence resulted in school heads needing staff to back their decisions and drive the implementation process, while dedicated PE teachers and programme promoters needed heads to support their ideas as teachers can be reluctant to be subordinated by their peers (Forman, et al., 2008; M. Ingemarson, Rubenson, Bodin, & Guldbrandsson, 2014).

6.1.4 Having a professional development course

PE teachers in particular have the ability to influence pupils experience of PE in a positive direction which is an important component in the overall promotion of PA in schools (Lewis, 2014). In relation, there is a general consensus that the investment in skill development of providers is vital in order to facilitate the capacity for change and securing implementation fidelity (Adamowitsch, Gugglberger, & Dur, 2017; Durlak & DuPre, 2008; D. L. Fixsen, et al., 2005; Greenhalgh, et al., 2004; Naylor, et al., 2015; Schuler, et al., 2018; Simovska, Nordin, & Madsen, 2016). However, such courses should not only develop the skills of teachers but also feed into their expectations, motivation and self-efficacy in order to ensure their continuous support of the programme (Durlak & DuPre, 2008; Forman, et al., 2008). In the Svendborgproject, the professional development course for PE teachers ensured both increased dedication to the programme and skill-level. Even PE teachers perceiving themselves as relatively competent to implement the programme reported that they benefitted from participating in the course. Furthermore, the course made it possible for PE teachers to have professional discussions and share ideas with colleagues across schools on how to plan and conduct PE. This led to the PE teachers creating a common language and a shared understanding of how to implement the programme. Such collaborative relationships and increased relatedness to a programme was also highlighted as beneficial by Sulz et al. (Sulz, Gibbons, Naylor, & Higginsb, 2016).

The professional development course was also designed to prepare PE teachers for the changes that the programme would bring by including a focus on the added pressure on gyms and facilities. Previous studies have identified the shortage of facilities, lack of resources and weather conditions as barriers to implementing schools-based PA (Nathan, et al., 2018; Naylor, et al., 2015). In the Svendborgproject such barriers were addressed in the professional development courses by including a focus on the use of outdoor facilities in different seasons and weather conditions. Planning outdoor PE aided the teachers in delivering the additional amount of PE despite a high pressure on indoor PE facilities, lack in activity resources or bad weather conditions. Nevertheless, it is worth noting that no matter how well a professional development course is constructed it is often not, by itself, enough to change practitioners' behaviour (D. L. Fixsen, et al., 2005; Pearson, et al., 2015). Establishing a foundation for successful implementation needs additional structures to support teachers' practice and ensure programme delivery (D. L. Fixsen, et al., 2005; Forman, et al., 2008; Masse, Naiman, & Naylor, 2013; Pearson, et al., 2015). The results suggest that these supporting structures for teaching practice were most effectively developed by having a school promoter serving as programme ambassador, by shared knowledge and decision-making through collaboration meetings and by having clearly defined programme requirements.

6.1.3 Enabling adaptation

Programme managers have acknowledged individual school autonomy throughout the implementation process, and schools were allowed to adapt programme requirements to their individual school context. The possible adaptation was deemed to have empowered localized decision-making and supported both operational capacity to install the programme and foster adaptive capacity to underpin continuous programme innovation. This was an important aspect of the programme as each school had different sizes, facilities and focus areas (nature, music, arts etc.) and illustrates the point of Kok et al. that when implementing programmes into a real-world setting the realized practices will become deeply embedded in the local context (Kok, Vaandrager, Bal, & Schuit, 2012). Adaptation to the local context

have shown to enhanced the likelihood of successful implementation (M. Bertram, Loncarevic, Radl-Karimi, Thogersen, et al., 2018; MacDonald & Green, 2001; Naylor, et al., 2015) which together with the results from the Svendborgproject, supports the argument that individualized programme adaptation should not be considered as implementation failure (Durlak & DuPre, 2008). Instead, individualized adaptation of programmes should be viewed as a beneficial tool for promoting ownership, strengthening implementation and developing sustainable programmes.

Despite being adapted to the individual school practice, the Svendborgproject has still achieved a high degree of fidelity. School heads highlight the importance of having rather simple programme requirements that provided a clear frame in which they were allowed to continue the local adaptation of the programme, which could account for the high degree of fidelity. The importance of having clear requirements with minimal room for misinterpretation was also found by Ingemarson et al. (Maria Ingemarson, Bodin, Rubenson, & Guldbrandsson, 2016) and implementing core elements is generally considered an important element in order for programmes to produce expected impacts (D. L. Fixsen, et al., 2005; Howie, et al., 2014; Lloyd, Dean, Creanor, Abraham, et al., 2017). Thus, the high degree of implementation fidelity of the Svendborgproject align with the findings of pupils increasing their health profile (Klakk, et al., 2014; Klakk, et al., 2013), being more active during school time (Moller, et al., 2014), and the improved fitness in pupils with low fitness levels (Rexen, et al., 2014).

The Svendborgproject as a concept was adapted three years after it was initiated, leading to two additional requirements being added to the original three and including all schools in the municipality in the programme. These new specifications were requested by school promoters. Such continuous adaptation of programmes to fit school needs has been shown to lead to better implementation and has in some cases been associated with better outcomes (Durlak & DuPre, 2008). Both programme managers and schools highlight that the results of research had a crucial influence on the political support for the Svendborgproject through the decision to secure programme funding, ultimately leading

to these adaptations. Thus, connecting research to a programme, proving that it can achieve success in a school context, helps to establish the foundation for political support and to develop strategies that can aid programme implementation at other schools. These supportive structures and practical suggestions from fellow schools regarding the implementation of the programme could very well be valuable resources for schools with less interest or experience regarding PA. This supports the notion that research can help secure political backing, which is vital to uphold a programmes infrastructure and secure programme maintenance and scale-up (McKay, Macdonald, Nettlefold, Masse, et al., 2015).

6.2 Methodological reflections

This section discusses the strengths and limitations of the thesis. An embedded mixed methods design was applied, combining qualitative and quantitative methods, to identify important factors that have influenced the successful implementation process of the Svendborgproject. This in order to feed into the established effectiveness studies by adding a deeper and more comprehensive understanding of the context in which the effects of the Svendborgproject were produced. In doing this, the thesis has adopted pragmatism as the scientific theoretical centre of inquiry. As the warranting of methods and methodological choices are fundamentally a philosophical matter, pragmatism will set the criteria for justification (Greene, 2007c; O´Cathain, 2010). Adopting pragmatism as the scientific theoretical centre, transferability should become the main quality criteria of the thesis, dictating that the knowledge gained only is as useful as the practical difference it makes in the real-world (Dewey, 1958; Charles S. Peirce, Houser, Kloesel, & Peirce Edition, 1992). However, the thesis has positions itself at the research stage (section 1.3, page 18), only qualifying the foundation and enabling the possibility for translation to other practices. As it is not the purpose of the thesis to commence practical changes in the real-world, transferability is discussed through the term 'pragmatic validity'. Pragmatic validity involves the applicability of the knowledge produced through a specific focus on descriptions and transparency of the context in which the implementation factors were identified (Kvale & Brinkmann, 2013).

The extensive focus on important implementation factors and contextual descriptions of the Svendborgproject has providing a unique insight into a real-world programme containing more PE in Danish primary school. As argued, the municipality of Svendborg is close to the average Danish municipality on a number of relevant aspects (section 1.5, page 21) and due to an Danish national school reform, focus has been set on PA during the school-day as an established part of the political agenda in the Danish municipals (Simovska, Nordin, & Madsen, 2016). Thus, the in-depth analysis of the Svendborgproject, alongside the fairly simple programme requirements should have strengthened the pragmatic validity and enabled practitioners and decision-makers to translate the knowledge gathered through the programme. Despite the general attention on school-day PA on the structural level (figure 1, page 16), all schools in the Svendborgproject initially found the programme relevant and in alignment with existing values and priorities at programme initiation. This could challenge the possible transferability to schools not having a grounded interest for PA and PE. Also, all schools were located in rural or suburban areas, which could compromise the possible translation to schools in urban areas. Especially considering that respondents on all programme levels has emphasised the importance of planning outdoor PE, the translating the programme to schools in urban areas without easy access to green spaces, could be a challenge. Furthermore, it is important to mention that the results only record the promotion of PE and are therefore not necessarily applicable to promoting PA in other forms. If PA is to be implemented during recess playtime or integrated into academic subjects (such as maths), different types of implementation concerns may possibly become relevant.

Although the primary criteria of quality is set as pragmatic validity and the applicability of the knowledge produced in the thesis, the quality of this knowledge should also be discussed.
Thus, the following sections will discuss both qualitative and quantitate methods used, in relation to the procedures and the tradition in which the methods primarily belong. Hereby, quantitative methods are discussed in relation to quality measures of validity and reliability, while qualitative methods are discussed in relation to their credibility following reflections on the confirmability and dependability of

the results (Greene, 2007b; Høstrup, Schou, Larsen, Lyngsø, et al., 2011). Finally, implications for future research is presented.

6.2.1 Qualitative methods

The purpose of the interviews was to elucidate the experience of implementing the programme. Still, the precondition of the thesis was to make a summative investigation as the process evaluation were initiated seven years after the programme was introduced at the schools. Hereby, the interviews described processes dating back several years and could contain some degree of recall bias. Preferably it would have been better to document the implementation process from programme initiation in 2008 by following the ongoing implementation process. By following the programme from the time of initiation, gathering data as the programme was developed and implemented, the results might have been more nuanced. Furthermore, if the process evaluation had been initiated at an earlier time, the concern for recall-bias could have been eliminated. In the thesis the influence of recall-bias was reduced by combining interviews with information from programme documents, ensuring that the results were supported by both data-sources. This included documents containing information during the planning, the implementation and the maintenance of the programme. Also, interviews were applied across the organizational macro, organizational micro and provider level, combining perspectives and experiences from various stakeholders (programme managers, school heads and PE teachers). By combing these various methods and stakeholder-perspectives through a complementary design, a more comprehensive understanding of the implementation process of the Svendborgproject were promoted, emphasizing key implementation factors deemed especially relevant by programme managers and school providers. Hereby the use of mixed methods increases the credibility of the inferences made.

To heighten credibility of the identified implementation factors, both PE teacher, school heads and programme managers were recruited based on an assessment of their in-depth knowledge of the implementation process. The three programme managers that were interviewed, were deemed the only

ones to hold such in-depth programme knowledge and exclusive insights on the implementation process on the organizational macro level. On the organizational micro level school heads were recruited based on their current or former engagement to the programme, most of them closely involved in the decision that their school should become involved in the programme. Finally, on the provider level, PE teachers who had acted as programme promoters across the six schools were primary sought as informants. However, PE teachers were only represented across three of the six schools in focus and given that the schools implemented the programme differently, adapting it to their existing context, insights from the provider level could have been strengthened by including PE teachers from all six schools. As all schools have been represented through school head interviews and programme documents, the credibility of the identified implementation factors should be reasonable solid. Still, it is recognized that PE teachers from the last three schools, could have elaborated or given additional insights to the identified implementation factors.

Both PE teachers, school heads and programme managers expressed a general positive attitude towards the programme and the results might have been more objective if data had been gathered at an earlier stage, before the programme was deemed a success and an integrated part of the school. While relevant respondents among programme managers and school heads were limited to a small number of eligible respondents, PE teachers represented a greater number. PE teachers acting as programme promoters were primarily targeted for recruitment due to their in-depth understanding of the programme and broad insight of the implementation process. Promoters, however, also acted as ambassadors for the Svendborgproject and compared to 'ordinary' PE teachers, promoters could have displayed a more positive attitude towards the programme. As four of the six teacher respondents were former or current programme promoters the information given could hereby contain some bias resulting in the Svendborgproject being portrayed in an overly positive light. This could profitably have been challenged by including additional interviews with PE teachers not affiliated with the role as programme promoter or non-PE teachers from other subjects. Such perspectives from non-promoters could have contributed

to a more nuanced view of the implementation process in the thesis. The positive attitude of respondents does not lessen the credibility of the implementation factors identified in the thesis, rather than suggest that other factors also could be relevant in order for non-promoter PE teachers to adopt the programme. This aligns with the application of strict abduction recognizing that new implementation process elements can be assigned to the explanation and tested in future studies in order to increase its predictive range (Shook, 2015).

6.2.2 Confirmability and dependability

In relation to confirmability of the results, it is worth highlighting that the PhD candidate did not have any personal or professional affiliation to the Svendborgproject before initiating his work. Before the initiation of the candidacy, the candidate was resident in another part of the country (northern Jutland) and only had basic knowledge of the Svendborgproject through the scientific articles produced in the CHAMPS-study DK. Also, even though the thesis is part of the CHAMPS-study DK, the candidate did not have any involvement in the earlier effectiveness measures nor relation to any of the respondents before the interviews were conducted. Hereby the candidate could be viewed as rather neutral evaluator without any stakes in the Svendborgproject nor the previous work done in the CHAMPS-study DK.

Through the application of pragmatism, the analysis has been driven by the empirical data with a strict focus and applicability of the conclusions drawn. This in order to fulfil the aim of identifying important implementation factors. Furthermore, abduction was used as the reason for inference. Yet, as pure abduction is not logically certain, strict abduction was applied to bring consistency to the analysis and heighten the dependability of the knowledge gathered through the tree studies included in the thesis. This was an important first step in order to fulfil the aim of the thesis, as it justifies the foundation on which the conclusions are drawn through a strict focus on relevant implementation perspectives.

6.2.3 Quantitative methods

Quantitative measures were included in the thesis with the main purpose to explore implementation and maintenance fidelity of the Svendborgproject. Implementation and maintenance fidelity supported the notion that the programme could be implemented in a Danish school context. Furthermore, fidelity measures linked programme activities and the established health outcomes. Hereby, the quantitative measures of fidelity are an important aspect supporting the qualitative data and the identified implementation factors.

To measure fidelity a questionnaire was developed based on programme manager interviews and programme documents. Generic measures for fidelity across different programmes does exist (Breitenstein, Gross, Garvey, Hill, et al., 2010; Shah, et al., 2017). However, when dealing with measures of fidelity the content of the questionnaire is very important, as it need to capture behaviours and processes of the specific programme (Breitenstein, et al., 2010). The choice to develop a new questionnaire rather than using an existing fidelity instrument was mainly due to the measuring of context sensitive fidelity items. Furthermore, the questionnaire was an embedded method under the interviews, thus, the questionnaire data should feed into the interview data. The content validity of the questionnaire was strengthened through several steps; revision by colleagues and programme managers as well as having two PE teachers correct any ambiguous or difficult questions (section 4.3, page 55).

Questions on implementation fidelity (fidelity as in 2011) could contain some degree of recall bias due to teachers reporting on activities a number of years earlier. Again, this concern for recall bias could have been reduced if the process evaluation had been initiated at an earlier time, while fidelity measures also could have been synchronised with the efficacy measures. In order to account for the possible recall bias, questionnaire data was either compared with fidelity information gathered through programme documents or school head interviews in order to strengthen the reliability of fidelity measures. Still, the reliability of the questionnaires could have been improved by collecting and analysing the internal

consistency of PE teachers answers across multiple-items. By having PE teachers provide information via multiple questions accounting for the each of individual element on which fidelity was measured, a split-half score could have been compiled, suggesting if there was internal consistency in PE teachers reports on the fidelity. In addition, some of the fidelity questions could have been difficult for teachers to answer clearly. Especially questions relating to pupils taking part in high intensity activity in each PE lesson and if they plan three hours of the additional PE included ATC-related, would be something teachers could have found difficult assessing and thereby reporting. Also, such self-report measures may be more biased than observational measures, and other methods could have strengthened the validity of the fidelity measures – e.g. by using observations focusing on ATC elements and objective measures of the pupils' pulse in the PE lessons.

6.2.4 Implications for future research

The thesis has identified and discussed four influential implementation factors when implementing additional PA in a Danish school context. However, based on the pragmatic perspectives adopted in the thesis, knowledge is also tentative and changing over time. Hereby research always follows a process of belief, doubt, inquiry, modified belief, new doubt, then new inquiry and so on in an infinite loop constantly aiming at improving our understating (Johnson & Onwuegbuzie, 2004). Based on the thesis and its results, the following will reflect on the perceived needs and implications for future research.

Firstly, as the thesis is part of the CHAMPS-study DK, the Svendborgproject has been discussed in relation to health promotion. However, perspectives relating to core school objectives (e.g. education), influences the implementation of school-based programmes and could have been discussed further in the thesis. This includes perspectives on education and learning through existing curriculums (Clarke, et al., 2013; Cutbush, Gibbs, Krieger, Clinton-Sherrod, et al., 2017; Simovska, Nordin, & Madsen, 2016), individual teacher teaching styles (Maria Ingemarson, Bodin, Rubenson, & Guldbrandsson, 2016; Naylor, et al., 2015; Sulz, Gibbons, Naylor, & Higginsb, 2016; Syrmpas, Digelidis, Watt, & Vicars, 2017),

classroom cultures and teaching resources (Naylor, et al., 2015; Sulz, Gibbons, Naylor, & Higginsb, 2016). In the thesis these perspectives are only referred to as part of the school context. Future research would benefit from documenting strategies on how health promotion programmes, such as the Svendborgproject, in order to align programmes with these important perspectives of education – ultimately heightening the likelihood of successful implementation.

Secondly, although both the organizational macro, organizational micro and the provider level has been explored, there are still programme levels that influence the implementation of school-based programme, that has not been addressed in the thesis. The perspectives of end-users is vital in order to obtain successful implementation (R. M. Bertram, Blase, & Fixsen, 2015; Glasgow & Emmons, 2007), however, the perspectives of pupils and their parents have not been explored. Thus, it is unknown how the pupils and their parents have reacted to the implementation of the programme and insights on strategies used to introduce and secure the backing of pupils and parents are missing. Furthermore, the structural level, including political and economic perspective, has neither been explored. As both programme managers, school heads and PE teachers express the importance of political backing and the financial support they were given as part of the programme, this level could contain information on how to secure the implementation and long-term maintenance of school-based programmes. Thus, future research should explore both the pupil level and the structural level if the Svendborgproject in order to provide additional insight and reveal if relevant implementation factors can be identified in addition to the four promoted in the thesis.

Thirdly, the thesis only includes the perspectives of the original six schools who chose to participate in the Svendborgproject. Although the rest of the schools in the municipality chose to become part of the programme when they were given the opportunity three years after initiation, it would have been relevant to explore why they initially chose not to participate. In future research the perspectives from schools who initially decided not to participate in the programme and the exploration of factors

influencing their initial decision to participate, could aid the establishing of better strategies when introducing future programmes to schools and teachers.

Fourthly, the thesis show that the Svendborgproject was implemented with high fidelity. Still, future research would benefit from gaining a more comprehensive understanding of fidelity-levels and programme outcomes. Based on the thesis it is not possible to estimate if the same health outcomes could be achieved with lower fidelity or if the various requirements are more or less important for the programme to be effective. By determining this relation between fidelity and the measured health outcomes, translation could be strengthened by allowing decisionmakers to identify must-have elements when adapting the programme to their individual context.

Finally, although the identified implementation factors in the Svendborgproject were discussed in relation to previous research, only few studies are known exploring the implementation of health promotion initiatives in the Danish context (Bentsen, et al., 2018; M. Bertram, et al., 2018; Bonde, Stjernqvist, Sabinsky, & Maindal, 2018; Simovska, Nordin, & Madsen, 2016; Smedegaard, Brondeel, Christiansen, & Skovgaard, 2017). Future research should explore which specific implementation factors are influential in a Danish context as well as if the identified implementation factors in the Svendborgproject are applicable when implementing health promotion programmes in other Danish schools.

7. Conclusion

The overriding aim of this thesis was to identify important factors influencing the successful implementation process of the Svendborgproject. In addition, special attention was put on contextual factors to clarify how the identified implementation factors have been applied in order to in order to enable translation to future school-based PA programmes. The core of the thesis consists of a qualitative dominant embedded mixed method design, including three studies exploring both the organizational macro, organizational micro and provider level of the programme.

Through the application of strict abduction, it was established that the Svendborgproject has undergone a successful implementation process by; initiating planning activities prior to any actual activities at school level; schools adopting and implementing a set of specified activities with a constant focus on improvement and maintenance and; including the perspectives of school heads and PE teachers across all programme stages. Subsequently, a meta-analysis across the three empirical studies revealed four main factors that influenced the implementation process: 1) programme being in alignment with existing school values and priorities, 2) programme managers combining a top-down and bottom-up approach, 3) PE teachers participating in a professional development course 4) enabling adaptability of the programme to the individual school context. These are factors also supported by international literature as important in relation to the implementation process of school-based programmes.

The scientific theoretical foundation of the thesis is based on the philosophical thoughts of pragmatism and has centred on the applicability of the knowledge produced. The municipality of Svendborg is close to the average Danish municipality on several basic aspects for a school-based intervention. Furthermore the latest Danish national school reform, has added a focus on physical activity during the school-day as an established part of the political agenda in the Danish municipals (Simovska, Nordin, & Madsen, 2016). The in-depth process analysis of the Svendborgproject has provided a unique insight into a successful real-world programme containing more PE in Danish primary school, and the identified implementation factors could prove valuable for other municipalities and schools when developing and

implementing school-based physical activities. On this basis, the following highlight implications regarding the implementation of future school-based programmes.

7.1 Implications for practice

Initially, implementation and maintenance of school-based PE is promoted when both programme managers, school heads and teaching personnel acknowledge that the initiative is of high value and manageable within an already packed school curriculum. Also, time allocated to incorporate additional PE into the daily schedule can serve as a successful promotion of PA without schools having to make a trade-off between promotion of PA and existing practices and priorities.

Secondly, when initiating school-based programmes, it seemed beneficial for programme managers to introduce a combination of top-down requirements and bottom-up involvement of schools. This combination of having few non-negotiable requirements, while involving participating schools to secure that the programme and implementation strategies fit overall school practice, aid both implementation and maintenance. Further, having a school programme promoter acting as a local ambassador and attending collaboration meetings with programme managers facilitates implementation. These collaboration meetings also aid schools' attention and commitment to the programme and acts as a reminder of the embedded requirements of a programme, which positively influences maintenance.

Thirdly, professional development courses support PE teacher capabilities and motivation for implementing the programme with high fidelity. Also, a focus on outdoor PE, considering different seasons and weather conditions, eases the pressure on indoor facilities and resources and thus supports the implementation of a highly-elevated amount of PE.

Lastly, adaptation to individual school contexts empowers localized decision-making and supports both operational capacity to install the programme and adaptive capacity to underpin continuous programme innovation. Also, the linkage to research can secure central political support that consolidate programme funding, ultimately allowing the possibility of programme adaptation, programme maintenance, and possible scale-up.

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Paper I-III

Paper I
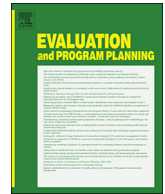
Implementation of triple the time spent on physical education in pre-school to 6th grade: A qualitative study from the programme managers' perspective

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ABSTRACT

Schools constitute an important arena for promoting physical activity. However, school-based programmes often face implementation challenges, and the identification of factors influencing the implementation process is considered important in order to secure the effectiveness of future interventions. The aim of this study was to identify factors influencing the various implementation stages during the initial years of a programme tripling the amount of physical education at the primary school level. Document analysis of publicly available programme descriptions and meeting minutes, were conducted. Document analysis was complemented by two semi-structured group interviews with main programme managers to gather in-depth programme experiences and perspectives. Results show that early involvement of schools may ensure the best possible match between programmes and the needs and resources of schools, and that an ongoing shared partnership may help programme managers address program challenges in early stages. It seems that predetermined core elements in programmes are essential. At the same time programmes must be flexible enough for adaptation to individual school contexts. Finally, the implementation of triple the amount of physical education, is supported by teachers receiving a professional development course focusing on how to organise outdoor physical education in different seasons and weather conditions.

1. Introductions

Studies have made it clear that physical activity (PA) has positive effects both on children and adolescents physical and mental health and on their academic achievement (Bauman, 2004; Bugge, 2015; Pedersen et al., 2016; Singh, Uijtdewilligen, Twisk, van Mechelen, & Chinapaw, 2012; Strong et al., 2005). International guidelines recommend that children of school age participate in at least one hour of moderate to vigorous PA a day (WHO, 2010). However, globally only a fraction of school-aged children and youth achieve this guideline (Inchley et al., 2016; Kalman et al., 2015). This is troubling, and there is a need for strategies that can lead to a sustained increase in PA in the younger generations. Studies have identified the school setting as an important arena when promoting the recommended daily level of PA among

children and young people (Dobbins, Husson, DeCorby, & LaRocca, 2013; Harris, Kuramoto, Schulzer, & Retallack, 2009; Waters et al., 2011). Yet, despite this focus on the inclusion of PA in primary schools, there is still a continuing need for implementation research that focuses on how to translate and disseminate effective interventions into everyday school practice with meaningful outcomes (Antikainen & Ellis, 2011; Austin, Bell, Caperchione, & Mummery, 2011; De Meij et al., 2010; Naylor et al., 2015; Saunders et al., 2013).

Since multifaceted school interventions in real-world settings often face implementation challenges, the documentation of both planned and realized pathways to put interventions into effect represents a key component in translating promising initiatives into practice (Austin et al., 2011; Dobbins et al., 2013; Naylor et al., 2015). The aim of this study, then, is to describe and analyse the experiences of the initial

implementation of the Svendborgproject (SP) – a long-term intervention programme, based in the Danish municipality Svendborg, focusing both on improving the quality of physical education (PE) and tripling the amount of PE in public schools. SP is regarded as an important school-based initiative to promote child and adolescent health. Quantitative research has proved its effectiveness in relation to overweight and obesity and a reduction in cardiovascular risk factors (Klakk, Chinapaw, Heidemann, Andersen, & Wedderkopp, 2013; Klakk, Andersen, Heidemann, Moller, & Wedderkopp, 2014). Subsequently, researchers were able to demonstrate that the increased amount of PE in SP-schools had no negative effect on the academic ability of involved children and young people (Bugge et al., 2017). It was also demonstrated that children attending SP-schools were more active and less sedentary during school time than students attending Non SP-schools (Moller et al., 2014) – an important finding for political decision-makers because it suggests that schools, offering an added amount of PE, may reach children and adolescents that otherwise are rather sedentary in their leisure time. These reports triggered even higher political interest. For instance, a few years into the programme the mayor of Svendborg, with the backing of the local government, announced that the municipality would allocate the funds necessary to involve all schools fully in the programme (Henriksen, May 5, 2011). The continued interest from both research partners and key municipal decision-makers is a salient feature of SP and have been suggested as part of the reason for the long-term sustainability of the programme over a period of nearly ten years and the expansion to all seventeen schools in the municipality. However, no qualitative studies have been conducted to investigate which factors have influenced implementation during the initial years.

1.1. Staged implementation

Implementation of school-based, behaviour-related interventions is a process that typically occurs in a number of stages, many times unfolding over the course of years, and typically including some core functions in each stage (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005; Fixsen, Blase, Naoom, & Wallace, 2009; Metz & Albers, 2014). According to Metz and Albers (Metz & Albers, 2014), the implementation process often starts with a number of preliminary steps prior to the actual intervention activities. Such early work ideally begins with a planning stage in which the needs of stakeholders and the implementing site as a whole is established. The fit of suggested intervention components with identified needs are subsequently appraised, together with the initial readiness and capacity of implementation teams and systems to adopt new practice (Metz & Albers, 2014). Via the following preparation stage, the necessary competencies and infrastructural support to deliver and maintain the intervention are developed further and consolidated (Metz & Albers, 2014). Following these initial stages, the intervention is put into practice and implemented with a focus on fidelity (understood as consistency of delivery as intended) and ongoing improvement and sustainability (Metz & Albers, 2014). While the stages imply a linear sequence of steps, in reality there is often a dynamic flow to the work. In other words, in practice the stages overlap with a number of iterations.

This study aim to identify factors influencing the planning, preparation and implementation stages of SP, as described by Metz and Albers (Metz & Albers, 2014) - among other things to evaluate to what degree the programme has followed an ideal format as sketched out above. This study provides unique insight into a real-world programme containing more PE in primary school that has successfully been implemented, maintained and later scaled up. By exploring the factors influencing the various implementation stages it is possible to support the implementation and sustainability of future school-based PA interventions.

2. Method

2.1. Setting

In Denmark children attend school from the age of 6 (pre-school) to the age of 16 or 17 (9th or 10th grade) and public schools are funded from taxes and organized by the local authorities in the municipality. The impetus for the SP came from municipal authorities initiating a partnership with Team Denmark (the Danish Elite Sport Foundation) promoting an added focus on PE in the municipality's primary schools. Municipal employees highly involved in the initiation of the partnership also took the role as programme managers and initially designed the outline of the programme. SP was designed in a political setting that valued evidence-informed approaches and where supporting children and youth in being active was part of the local education agenda. Consequently, all nineteen primary schools in the municipality of Svendborg were invited to participate in SP, of which six chose to participate. These six schools have been part of the programme since initiation in 2008 and been scheduling 4.5 h of weekly PE for ten years. Schools choosing not to participate in the programme substantiated that it was due to either logistical or economic reasons (e.g. allocating resources for teacher salaries due to the additional hours of PE and PE teachers needing time to participate in the professional development course). However, shortly before SP was initiated by the schools, politicians decided to support the six participating schools financially.

School managers and PE teachers from the six participating schools were invited to take part in a working group responsible for designing a setup that would triple the amount of weekly PE from pre-school to 6th grade. The core elements of the programme, which all schools had to implement, involved the school-children receiving a minimum of 4.5 h of PE every week spread over at least three school days. When SP was initiated the norm in Denmark was 1.5 h of PE every week. In addition, each school had to assign a programme promoter (a school staff member) to act as ambassador for the programme and participate in programme meetings, and all PE teachers were to attend a professional development course based on an Age-related Training Concept (ATC) developed by Team Denmark (Bach & Eiberg, 2010; Pryce, Willeberg, Falkentoft, & Meyhoff, 2005). The main principles of ATC are to focus on children's physical, physiological, mental, and social development to enhance and optimize motor skills. The resulting plan was accepted by the city council prior to implementation at the participating schools.

The programme was not initiated for the purpose of research, which markedly increased the likelihood that similar approaches could, if relevant, be implemented elsewhere in Denmark and maybe even in other countries. From the very beginning, however, key sponsors and managers of the programme allowed researchers to follow the programme. Hence SP has been characterized as a community-based intervention, studied by researchers as a so-called natural experiment (Craig et al., 2012; Wedderkopp et al., 2012). In a multifaceted quasi-experimental study, with matching of SP-schools and Non SP-schools, the research group was able to demonstrate that the intervention lead to relevant modifications in PA behaviours among school-aged children and important health aspects (Klakk et al., 2013, 2014; Moller et al., 2014). An overview of the various operators in the initial process is illustrated in Fig. 1.

2.2. Design of this study

The present study is part of a larger programme of research, the Childhood Health, Activity, and Motor Performance School Study (CHAMPS-study DK), that addresses the overall evaluation of SP (Wedderkopp et al., 2012). This research programme has two aims: a) to identify the effects of the programme on physical health and cognitive performance/academic achievement, and b) to evaluate the implementation process of SP in order to establish recommendations on how to translate new findings from school-based PE programmes into
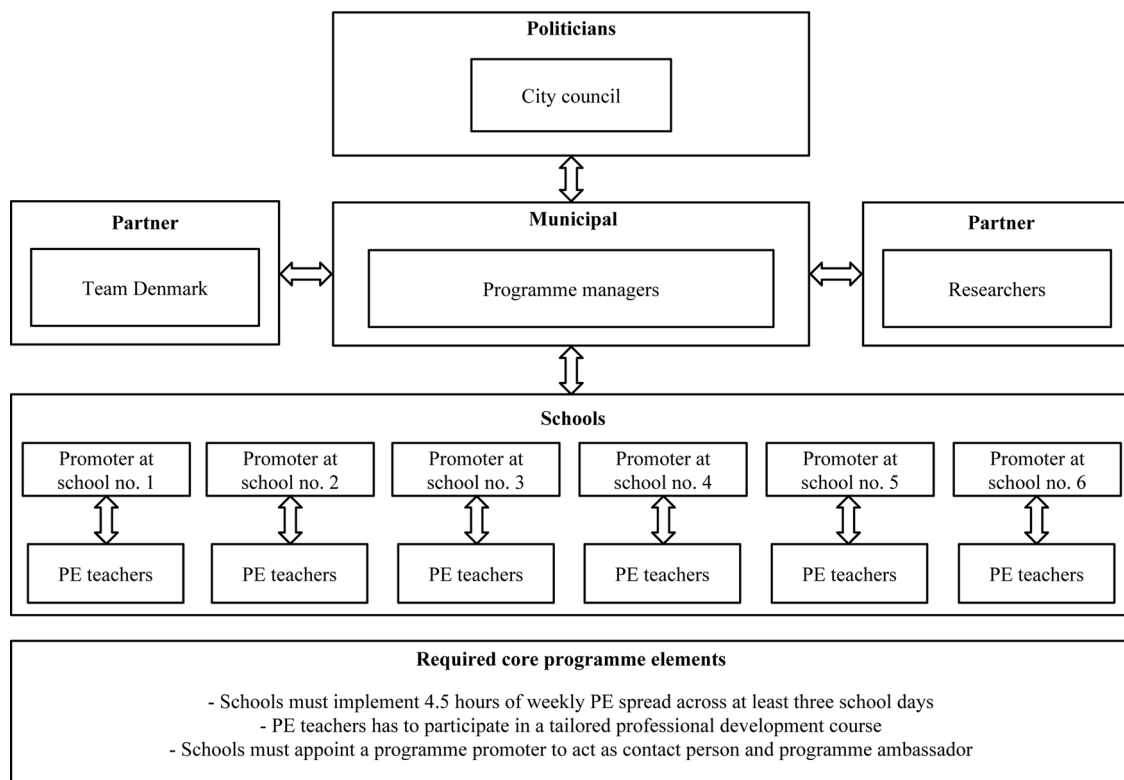
Fig. 1. Overview of the various operators of the programme and required core programme elements.

practice and identify applicable procedures to design and implement multifaceted PA initiatives at the school level. The present study relates to the latter.

2.3. Methodology

To identify factors influencing the various implementation stages described by Metz and Albers (Metz & Albers, 2014), both document analysis and semi-structured group interviews were conducted. The document analysis was used to identify salient implementation factors and to underpin the construction of a more pertinent interview guide (Greene, 2007a). Following the interview rounds, the documents and interviews were collated with a view to have them complement each other through an integrated analysis (Greene, 2007a). Additionally, the study adopted a pragmatic standpoint, focusing on identifying elements that could be important and/or have worked in a particular programme aimed at engaging schools in increasing the amount of PE (Denscombe, 2008; Greene, 2007b).

2.4. Interviews

2.4.1. Sampling

To complement the document analyses, interviews focused in particular on programme experiences during the planning and preparation stage. Purposeful sampling of key informants was used to create a pool of respondents who were most likely to have accumulated detailed insight into the programme over prolonged periods of time (Kelly, 2010). Respondents were chosen from those programme managers who had been employed during the initial years of the programme. Programme managers were chosen as they have not only been disseminating strategies and guidelines to schools and other stakeholders but have also been in close dialogue with each school and gathered information from all stakeholders in the programme (Fig. 1). Thus, programme managers had in-depth knowledge and insight of the preparation, planning and implementation stages. Five programme

managers met this criterion and three of these were invited to participate. Two were still working on the programme, while the third, who was considered to be the founder of the programme, was no longer attached to the municipality. The two programme managers not included in the study sample had only been temporarily involved in the programme.

2.4.2. Conducting the interview

Interview data were collected by means of two face-to-face semi-structured group interviews and conducted by the first author (JVN) and the fourth author (MLA). All three programme managers were present at both interviews. Semi-structured group interviews were chosen in order to bring together these three primary respondents and gather their collective memory and constructions. Due to the possibility of respondents experiencing memory gaps of different processes, being in a group interview allowed them to comment on things that they not would have brought up in a single interview due to re-call difficulties. Interviews were performed in a private room at the workplace of the current programme managers. Both interviews were audio recorded.

The interviews were based on the various implementation stages presented by Metz and Alberts (Metz & Albers, 2014). The interview guide consisted of open-ended questions and an example of the inter-view-guide can be found in Appendix A. The first interview mainly focused on, but was not limited to, the planning stage and the aim of the programme. This formed the basis for the second interview, which mainly focused on the preparation stage through planned implementation strategies. Respondents received a letter of information before the interviews, explaining the purpose of the interview, underlining the focus on the pre-programme period and programme start-up phases. Following the first interview, the data were analysed and a second interview with the same three programme managers were performed. This was done to increase depth and credibility of the information gathered in the first interview by promoting elaborations and clarifying unclear descriptions or uncertainties. Examples of supplementary questions in the second interview were: During the last
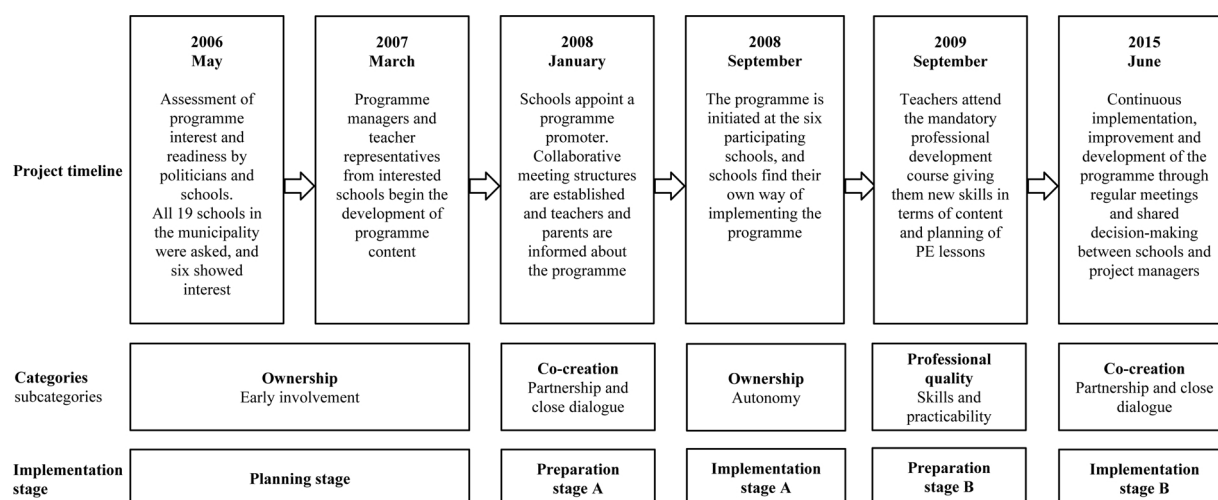
Fig. 2. Programme timeline across categories and sub-categories, implementation stages and data-sources. Note: The preparation stage was also meant to include a professional development course for the teachers, but the course was not established until a year after the programme had been initiated at the schools. Because of this, the table display both a preparation stage A and B as well as an implementation stage A and B.

interview, we talked about the goal of the programme. Our impression was that the two overarching goals were [results from the first interview] - Is this correct?

2.5. Documents

Documents were retrieved in two stages, firstly via programme managers responsible for documents dating back to the initial programme planning period, and secondly by searching the municipal electronic archives and school websites for additional records regarding SP. All retrieved documents formed part of the public record (Nielsen, 2017) and can be sorted into five categories: city council minutes (n = 3), collaboration minutes (n = 9), information material on programme content (n = 1), early evaluations (n = 2) and individual school strategy reports (n = 5).

City council minutes outlined the initial programme plan, as it was presented and subsequently approved by local political committees and councils. The collaboration minutes mainly describe and map the working relationship between programme managers and school promoters (comprising both school leaders and PE teachers). The specific information materials (in the form of a comprehensive brochure) was produced by the programme managers and contained information on core content and what being part of SP involved. Early evaluations are from two different timepoints; one after two years by school promoters and programme managers assessing the initial implementation process; and one after three years collecting the experiences from participating schools on how to implement the programme. School strategy reports were produced by participating schools describing their implementation process during the first three years. Only five school strategy reports were created due to two schools from the same district choosing to compile a joint school strategy report. Altogether, the documents recorded experiences reported both by programme managers and by schools covering the period of 2007–2012, the main weighting being on 2010–2012 (n = 16).

2.6. Ethical considerations

Written informed consent, also containing consent for publication, was collected from all participants at the beginning of each interview. The programme of research was approved by the Danish Research Ethics Committee (Project-ID: S-20080047 and S-20140105).

2.7. Analysis strategy

Both document and interview data were analysed using qualitative content analysis (Schreier, 2014). Firstly, data were inductively sorted into emerging categories, and sub-categories were created among the individual categories. Subsequently, all material was examined by the first author (JVN) to make sure all relevant aspects had been covered by a category.

2.7.1. Documents

Documents were analysed prior to conducting the interviews – among other things to establish to what degree they could fulfil their intended role in supporting the design of the guide for the interviews and offering a supplementary perspective to the empirical materials generated via interviews.

2.7.2. Interviews

Prior to actual analysis, the recordings of the interviews were listened through to achieve familiarity and then transcribed by the first author (JVN) and fourth author (MLA). Respondents were anonymized and assigned a number (1–3).

2.7.3. Integrated analysis

As a final step, the interviews and the document materials were combined in an integrated analysis. Categories and sub-categories identified in the interview were compared with the initial categories from the document analysis in order to confirm congruity, to make adjustments or to create new categories. To enhance trustworthiness, MLA was given access to the coding and assessed the analysis through peer-debriefing, systematically and critically examining the adequacy of the coding (Barbour, 2014). Through discussion of discrepancies, JVN and MLA reached consensus for the categories and sub-categories. Finally, a joint list of categories and sub-categories was constructed across the two methods. To ensure the credibility of the analysis all categories and sub-categories were identified in both interviews and in at least two of the different document sources (Table 2). Findings were sent to the interviewed programme managers for comments and validation. In the final step of the analysis all categories and sub-categories were categorized in relation to each of the implementation stages outlined by Metz and Alberts (Metz & Albers, 2014) (Fig. 2).

Table 1
Overview of categories and sub-categories with sub-category descriptions.

Categories and sub-categories	Elaborations of sub-categories
Ownership	
- Early involvement	Schools were asked if they were interested in participating in a programme increasing the amount of PE. Interested schools were invited to join the initial workgroup that developed the final version of the programme
- Autonomy	Programme managers acknowledged schools as having individual autonomy and interests and encouraged schools to fit the programme to their individual school context
Professional quality	
- Skills	PE teachers participated in a mandatory professional development course giving them new skills concerning teaching methods
- Practicability	PE teachers became more aware and were given tools to help them arrange outdoor PE in all seasons and all weather conditions
Co-creation	
- Partnership	Schools assigned programme promoters, who participated in collaboration meetings at which they had ongoing influence on programme improvement and development
- Close dialogue	Programme managers strived to be visible at the schools and established regular meetings with school promoters

3. Results

Integrated analysis revealed three categories influencing the implementation process: (i) Schools' sense of ownership of SP, (ii) Professional quality of the PE lessons, (iii) A collaborative and creative mindset shared by programme managers and schools. Two sub-categories were identified in each of these categories. An overview of sub-categories with short descriptions is displayed in Table 1.

3.1. Ownership

3.1.1. Early involvement

Interviews and minutes from city council decision meetings, showed that all schools in the municipality of Svendborg were initially asked if they were interested in participating in a programme focusing on increasing the amount of PE. Those schools who chose to be part of SP were also asked to join a working group. This group adjusted initial ideas and suggestions on programme content into a plan best suited to the schools of the municipality. For instance, the working group produced a strategy for unrolling the programme over a three-year period, which at the start included pupils from pre-school to 4th grade in 2008, adding 5th grade students in 2009 and 6th grade students in 2010. The content suggested was initially outlined by Team Denmark and the programme managers. One of the aims of this process was also to establish core programme elements that had to be implemented at all participating schools. However, the working group was not limited by this content but could develop additional aspects. The workgroup was, at first, asked not to think in terms of the economical expenses, such additional working hours or the lack of materials and facilities (e.g. gym time and equipment).

[The schools] were to report back if they had interest [in

participating in the programme]. And those who were… helped create the concept … that's the secret! … They were not to think of limits, they were not to think of economy, and they had to think out of the box … it took a while, but then it just dawned on them, and they could not stop smiling, and it was like this… this is going to be great! [Programme manager 3]

3.1.2. Autonomy

Interviews show that the programme managers acknowledged schools as autonomous partners and assisted them in adjusting the concept to their specific institutional context. Acknowledging autonomy encouraged the schools to find their particular way of implementing core programme elements (4.5 h of PE distributed over at least 3 days a week and having all PE teacher participate in a professional developing course and having a programme promoter) and, in the process, tailoring them to their individual conditions. The interviewees points to this feature as important for school compliance with the program – among other things because it supported both school heads and teachers in their work with making the programme work in an already full curriculum.

> Even though the schools focus on physical education, they can still focus on other things, e.g. creative subjects. The school is of course for all children - not just those interested in sports [Internal evaluation, 2010]

All schools developed individual school strategy reports describing how they had adopted and implemented core elements and how being part of the programme had affected their school. Schools had different ways of fulfilling the core elements and made different adjustments in their approach to the programme. Some schools, for instance, chose to split the 4.5 h of PE over five days a week, and some chose to split the

Table 2
Categories and sub-categories across data sources.

Categories and sub-categories	Data source					
	City council minutes (N = 3)	Programme information material (N = 1)	Individual school strategy (N = 5)	Collaboration minutes (N = 9)	Early evaluations (N = 2)	Group interviews (N = 2)
Ownership						
- Early involvement	3	1	–	–	–	2
- Autonomy	–	–	5	4	1	2
Professional quality						
- Skills	–	1	3	5	1	2
- Practicability	–	1	5	4	2	2
Co-creation						
- Partnership	–	–	1	4	1	2
- Close dialogue	–	1	–	9	2	2

same amount of PE over three days a week.

If schools had supplementary ideas, they were also encouraged to make additional initiatives as part of their involvement in the programme. Hence, some schools chose to increase focus on PA in other subjects by adding extra elements like dancing in their music lessons or by jumping to multiplication tables in maths. Some schools also increased focus on conducting more lessons outside the classroom to promote PA, and some promoted active commuting to school (walking, cycling etc.).

> During the winter period, we have trained for a joint spring concert and it was a huge success. We repeat the concept again this year. Students are given the opportunity to immerse themselves in something special, master it and show it. It has been a very valuable and inspiring first year. We have also operated with a structure where teachers were planning together so that several classes could have physical education at the same time. They had different stations in the gym and it led to high intensity and positive energy [School strategy report 2009]

3.2. Professional quality

3.2.1. Skills

Interviewees emphasised that one of the core aspects of SP was not only to implement more PE but also to ensure an increase in professional quality of PE. This was done by enrolling all participating PE teachers in a professional development course providing them with (i) the skills needed to deliver new teaching methods and new ways to organise the extra PE, and (ii) knowledge and understanding of the primary aims and unique qualities of SP. Initially this course had been established as one of the core elements that all schools had to implement to be part of the programme. However, the course was not available until almost a year into the programme, even though teachers had requested it. Both interview data, documents covering the initial program evaluation and individual school strategy reports reveal how, once provided, the course promoted teacher support and their ongoing motivation for implementing extra amounts of PE. Interviewees emphasized the importance of investing in the teachers and showing them that they were of crucial importance for the success of the programme.

> Teachers have gained new knowledge and been energized. It [the professional development course] have forced teachers to reflect on the content of their physical education lessons in a new way … The physical education lessons have changed significantly - the teachers have brought a lot of new knowledge to school… [Internal evaluation, 2010]

3.2.2. Practicability

A part of the mandatory professional development course focused on practicability and how to organise the additional PE. This included the use of outdoor facilities by conducting PE in different seasons and weather conditions. The interviews, individual school strategy reports, collaboration minutes and initial evaluations all show that the use of outdoor facilities supported the teachers in their planning in the event of the gym being occupied due to the general increase of PE at the schools. Awareness of practicability was perceived as supporting elements that boosted the quality of teacher preparation and skills in delivering a greatly enhanced volume of PE. Interviews also revealed that the courses aimed at facilitating the teachers' creativity about new curriculum activities.

> There is also a module in the professional development course where [the teachers] learn how to use the available outdoor areas - because everyone can't use the gym at the same time. But how do we use this outside, for example, how do you use parkour in physical education, how to use all such things? So [the teachers] became

more creative and got new ideas… [Programme manager 3]

Interviews, initial evaluations and collaborative minutes also revealed that the course enabled teachers to have professional discussions and share ideas with colleagues on how to plan and conduct PE. This allowed the teachers to create a shared language and understanding of the task at hand.

3.3. Co-creation

3.3.1. Partnership

The programme is based on a partnership between the programme managers, representing the municipal administration, and the participating schools. The partnership is grounded in a vision in which participating schools are involved in ongoing decision-making regarding programme improvement and development. The empiric data, gathered and generated for this article, reveal not only the degree to which schools were informed during the programme meetings, but also the extent to which they were asked to comment and make decisions about the adjustment and development of the programme. Furthermore, both interview and document materials report on how each school selected a programme promoter, acting as the primary contact person to strengthen the link between the overall programme and the individual schools. School promoters helped the programme managers to identify and act on any emerging problems, enabling programme managers to facilitate local problem-solving at an early stage. School promoters also acted as programme ambassadors at their schools and took part in the regular collection of implementation experiences from PE teachers. These experiences were shared at programme meetings attended by programme managers and school promoters from all participating schools. The interviewees point to this partnership process as a key component in the successful implementation of the programme at both school and municipality level.

> We have a planning group, which consists of the schools and me… and I need to find out what they need and what we need to talk about… because it shouldn't come from me, it must be the schools… like how would the like to work with the programme… and then we facilitate that from our end… and these meetings is crucial, because otherwise it would only be top-down… that we as programme mangers just created something and gave it to them, but it was an interaction, it was a collaboration! [Programme manager 2]

3.3.2. Close dialogue

From the outset, efforts have been made to build strong connections between overall municipal administration and the individual schools Programme managers have made continuous efforts to be visible at participating schools and to set up regular meetings with school promoters to follow up on core activities, joint agreements and to support continued school engagement. The aim has been to combine top-down (starting from the perspective of central decision-makers) and bottom-up (starting from a network actors involved in service delivery) approaches in the implementation of the programme. Additionally, the programme managers – in order to build strong relationships with participating schools and supporting teachers - regularly made use of school events to highlight the main aims, concepts and visions of the programme to key partners such as school staff, students and their parents. For instance, the empirical data included in this study show that programme managers used parent meetings to explain the prospects of the programme and to give teachers and parents the opportunity to ask questions.

> Well, it breaks down some barriers because it's like two cultures. We're [Administration in the municipality] a culture and the schools are another culture, and it may be that something we think is simple is hard for them and vice versa… I think it helps break down those cultural gaps and then they don't say, "You're just sitting at City

Hall" because we are out on site and have been so often that they feel there is a genuine interest [Programme manager 1]

3.4. Categories and sub-categories across implementation stages

All categories identified had an influential impact during one or two of the implementation stages described by Metz and Albers (Metz & Albers, 2014). Analysis shows that the planning stage, which involved the early involvement of schools, led to marked school ownership to SP.

The preparation stage involved a collaborative and creative mindset by establishing a partnership between programme managers and the schools. At this stage schools also chose a promoter to support close dialogue between schools and programme managers of the overall programme. A professional development course with special focus on ATC was also to be part of the preparation stage. However, this component was not established until a year into the programme.

The implementation stage started with the initiation of the programme at all six participant schools. To promote solid programme ownership at school level, these were encouraged to establish their own 'local implementation structures', and thus individualize the programme to their particular context. In the implementation stage, programme managers maintained the collaborative mindset by involving schools in the improvement and development of the programme. An overview of the timeline of SP across the categories and sub-categories identified and the different implementation stages is displayed in Fig. 2.

The delay of the professional development course for the PE teachers resulted in an overlap of the preparation and the implementation stages. For this reason, the programme had a preparation stage A (establishing partnership and close dialogue) and a preparation stage B (the professional development course) as well as an implementation stage A (promoting ownership by encouraging individualised implementation strategies at participating schools) and an implementation stage B (maintaining partnership and close dialogue through shared decision-making regarding programme improvement and development).

4. Discussion

The present study aims at identifying factors of particular importance in different implementation stages related to a long-lasting programme promoting PE in primary school. To our knowledge this is the first study to examine the implementation process of a multi-year, natural experiment designed to add a substantial amount of PE in primary school curriculum. Using a combination of document analysis and interview methodology this study expands existing literature by identifying factors that programme managers and other key participants in the mobilisation of school participation find to be particularly important in the initial stages of implementing more PE in primary schools. Our results suggest (i) that early involvement and ongoing shared decision-making by key stakeholders helps to ensure that school-based programmes from the outset and continuously matches the individual needs and context of schools and enhances school entities sense of ownership (ii) that appointing school promoters, and setting up frequent meetings focused on timely problem solving communication, assist programme managers in the ongoing improvement of the programme and allow them to address difficult issues at an early stage, and (iii) that intervention programmes such as the one described seems to benefit from having PE teachers attend professional development courses focusing, among other things, on building teacher commitment to core programme elements and, very practically, advise on how to organise outdoor PE in various seasons and weather conditions.

4.1. The planning stage

Our findings reveal that the early introduction of collaborative work

between especially schools and programme managers, and the establishment of school ownership for the successful execution of the programme, was perceived as a key factor in securing successful implementation. This supports the findings of others (Durlak & DuPre, 2008; Fixsen et al., 2005), highlighting the importance of early and continuous stakeholder involvement to obtain successful programme initiation and maintenance. In this study, a high degree of ownership was sought in the planning stage by actively involving schools that had shown interest in the overall programme vision. This enhanced the feasibility of implementation.

In early programme stages, it is generally perceived as crucial to ensure that the programme clearly meets the needs of and resources of end-users (Metz & Albers, 2014). SP strived to accommodate this by involving schools in the formulation and design of core programme elements (4.5 h of weekly PE over at least 3 days and including all PE teachers participate in a tailored professional development course and having a programme promoter). Schools were required to implement these core elements if they were to be part of SP. However, programme managers acknowledged individual school autonomy, and schools were allowed some degree of freedom when applying the programme to their school context. To promote this process, schools were encouraged to develop a school strategy report, describing how SP would be carried out in practice and be adapted to their specific school. Thus, although SP consisted of specified, obligatory components designed to be delivered using ATC, the programme allowed for flexibility and adaptability to the school context. This top-down leadership approach and bottom-up practice has been highlighted as an important factor for successful implementation as it promotes knowledge dissemination as a two-way street in which 'evidence based practice' and 'practice based evidence' are combined (Ogden & Fixsen, 2014)

This flexibility, via the possibility to adapt the programme to specific school contexts, is deemed to have empowered localized decision-making and supported both operational capacity to install the programme and foster adaptive capacity to underpin continuous programme innovation - hereby enhanced the likelihood of successful implementation (MacDonald & Green, 2001; Naylor et al., 2015). This supports the argument that individualized programme adaptation should not be considered as implementation failure (Durlak & DuPre, 2008). Instead, our results suggest that the adaptation of programmes should be viewed as beneficial for promoting ownership, strengthening implementation and developing sustainable programmes. Still, it is important to note that core elements of a programme must be delivered in order for it to produce expected impacts (Fixsen et al., 2005; Howie et al., 2014; Lloyd et al., 2017). In SP, the core delivery consisted of a) 4.5 h of mandatory PE distributed over at least 3 days a week, b) that all PE teachers participated in professional development courses and c) having a programme promoter.

4.2. The preparation stage

Teacher buy-in was deemed especially important because it was primarily their role to provide the additional PE and to increase the quality of PE lessons. To support the teacher's capabilities and their motivation for the programme, a mandatory professional development course was planned to be ready at programme start-up. Development of teacher competencies is generally considered a key component in ensuring solid delivery and fidelity of school-based intervention programmes (Metz & Albers, 2014). However, the course was not ready until a year into the programme and the teachers had to figure out how to plan the extra PE without the intended development skills. Results show that teachers expressed a need for upgraded and updated qualifications and that, when the professional development course was finally available, it was highly valued by teachers, giving them new ideas for training exercises and ways of differentiating PE across the different student ages.

Previous studies have identified the shortage of facilities, lack of

resources and weather conditions as barriers to implementing schools-based PA (Naylor et al., 2015). In SP these barriers were addressed during the teacher professional development course by including the use of outdoor facilities in different seasons and weather conditions. This aided the teachers towards more creative planning of PE and in delivering the additional amount of PE despite shortage of indoor facilities and activity resources and in all weather conditions.

The training of programme providers, such as teachers, is generally considered a core implementation component throughout the literature (Durlak & DuPre, 2008; Fixsen et al., 2005; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004; Naylor et al., 2015). However, these courses should not only develop the skills of teachers but also feed into their expectations, motivation and self-efficacy in order to ensure their continuous support of the programme (Durlak & DuPre, 2008; Forman, Olin, Hoagwood, Crowe, & Saka, 2008). The professional development course was also designed to prepare teachers for the changes that SP would bring by including a focus on the added pressure on gyms and facilities. Furthermore, the course made it possible for teachers to have professional discussions and share ideas with colleagues on how to plan and conduct PE, which led to the teachers creating a common language and a shared understanding of how to implement SP. Nevertheless, it is worth noting that no matter how well a professional development course is constructed it is often not, by itself, enough to change practitioners behaviour (Fixsen et al., 2005; Pearson et al., 2015). Establishing a foundation for successful implementation needs additional structures to support teachers' practice and ensure programme delivery (Fixsen et al., 2005; Forman et al., 2008; Masse, Naiman, & Naylor, 2013; Pearson et al., 2015). Our results suggest that these supporting structures for teaching practice were most effectively developed by having a school promoter serving as programme ambassador, by sharing knowledge among all participating schools through regular meetings and by designing the programme as a broad-based partnership.

4.3. The implementation stage

Durlak and DuPre state that a non-hierarchical approach with shared visions and decision-making has a positive impact on organizational capacity to secure successful implementation (Durlak & DuPre, 2008). In SP this capacity was promoted by maintaining close dialogue between the programme managers and participating schools and by approaching the programme as a partnership in which participating schools are involved in ongoing decision-making. School promoters were a specific component in the partnerships, acting as a link between individual schools and programme managers. School promoters kept the programme managers informed about what was actually being done on the individual schools. This supported the programme managers in making information based assessments of implementation status, to react swiftly to any problems and to fine-tune future programme development. Such reflections and focus on the ongoing implementation process is considered an essential hallmark ensuring programme quality and fidelity (Metz & Albers, 2014).

Programme managers also invested considerable time and energy in being visible at participating schools and facilitating local problem-solving related to programme development and implementation. This included communicating the potential and progress of the programme to key stakeholders in the form of teachers, school management, students and their parents. The high degree of visibility and interactive information has been important in the promotion of programme visions and goals – resulting in adequate programme interest and commitment of schools and parents.

4.4. Strengths and limitations

SP has successfully been implemented, maintained and scaled up. Thus, the study provides a unique insight into a real-world programme containing more PE in primary school and presents itself as ideal for exploration factors influencing the various implementation stages. However, in the quest of fulfilling this aim we recognize that the study has a number of limitations. Our document analysis mostly reports on the process from the start of implementation in 2008 and contains relatively sparse information concerning the planning and preparation stage of the programme. To strengthen our empirical foundation of the early implementation stages, we used document analysis to develop relevant content for subsequent interviews with programme managers. The interviews contained only a small sample size as only three programme managers were identified to yield in-depth knowledge on the various implementation stages of SP. Also, the interviews could contain some degree of recall-bias as the interviewees were asked to describe processes dating back several years. Group interviews were chosen as respondents could experience memory gaps of different processes, being in a group interview allowed them to comment on things that they not would have brought up in a single interview due to re-call difficulties. Hereby group interviews sought to combine programme managers' collaborative recollection on the implementation process and strategies. To promote depth and credibility of the information gathered in the first group interview, a second was performed to clarify unclear descriptions or uncertainties. Additionally, to counter the small sample size in interviews and minimize potential recall-bias, we combined document analysis and interviews to create an integrated and complementary analysis that ensured that all statements from programme managers were supported by at least two other data source (Table 2). The complementary approach aimed to promote a more comprehensive understanding of the planning, preparation and implementation stages of SP, emphasizing key implementation factors deemed especially relevant by programme managers and schools. Nevertheless, it is important to recognize that both interviews and documents may display a positive bias towards the programme due to participants' affiliation to it. However, this does not belie the fact that the programme has been successful in maintaining 4.5 h of weekly PE for all schools in the municipality over several years and expanding to the rest of the schools in the municipality. Finally, programme managers were identified to hold the best in-depth knowledge and insight of factors influencing both the preparation, planning and implementation stage. However, future research is needed focusing on entire implementation process´ in order to achieve a more detailed insight into schools' experiences of staff mobilization and organizational readiness when implementing increased amount of PE. In particular, a school perspective on the adoption, fidelity and processes securing maintenance would add value to the knowledge of how to support the implementation of future school-based PA interventions.

5. Lessons learned

Firstly, an important lesson has been learned in relation to the evaluation of natural experiments and collaboration with practice. When evaluating these types of programmes, initiated and facilitated in a real world setting by private or governmental institutions, it is important to gather as many insights as possible during the planning and preparation stages. In our view experiences from these programme stages are important to support and expand best-practice guidelines on translating evidence-based programmes into effective practice. Thus, we recommend close collaboration with practice in order for scientists to document how and why decisions are made during the planning and preparation stage - contributing with knowledge on how early programme decisions can influence the implementation, efficacy and sustainability of the entire programme lifecycle.

Secondly, a valuable lesson for future programmes concerning PE in primary schools has been established. When adding more PE in primary schools, programmes should require schools to fully implement core elements, but still be flexible enough for each school to fit these core elements to their daily practice. Such a double-sided approach supports

the best possible design and realisation of effective programmes in specific contextual circumstances. Additionally, adding more PE in pre-school to 6th grade may put a high pressure on indoor PE facilities. To compensate for this potential challenge, teachers should focus on ar-ranging outdoor PE. In relation to this, PE teachers can benefit from participating in a professional development course – for instance fo-cusing on how to arrange outdoor PE.

Finally, early involvement of key actors, delivering the programme, helps to ensure that initiatives, such as the Svendborgproject, from the outset match the needs, ambitions and individual context of the im-plementation sites. Furthermore, joint programme ownership seems to be promoted by solid partnerships between overall programme man-agement and the actors (i.e. schools and involved staff) responsible for actual programme delivery.

6. Conclusion

The present study contributes to existing literature by presenting factors that programme managers and schools experience as particu-larly important in the early stages of implementing a highly-elevated amount of PE in primary schools. Our findings point to the significance of early involvement of schools during the planning stage by asking school representatives to assist in the development of programme content and planning. During the preparation stage, it was important to establish a shared partnership through the appointment of school pro-moters and through regular meetings. These actions have assisted the programme managers in the ongoing improvement of the programme and made it possible for them to address problems and struggles at an early stage. Additionally, professional training on a specialist course for teacher development played an important part in enabling PE activities in all seasons and weather conditions and thereby ensuring the success of the programme. Finally, programmes can benefit from the balanced requirement that core elements be implemented fully while at the same time securing that initiatives can be adopted with some degree of flexibility to meet individual schools´ needs and wider context.

Competing interests

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Appendix A. Supplementary data

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Appendix A

This is an example of the interview-guide used in the first of the group-interviews with programme managers in the Svendborgproject. The full interview-guide will be sent on request by contacting the first author.

Introduction to the interview

Introduction:

In general, we conduct the interview because we are interested in learning more about the history of the Svendborgproject. We are aware that the Svendborgproject was born and raised in the municipality and it is especially the municipal and your perspective as managers that we would like to have a better insight into. The interview will initially and mainly address the planning and structuring of the Svendborg project. Below we will also ask what consideration was given to how the plan should be implemented and the actual implementation of the project. In the end, we will talk about the process after the project was started and how it has developed and been maintained over time.

We hope that at a later date in the process you will want to talk to us if we find interesting topics that we will follow up or if we do not reach all our questions today.

The purpose of the Svendborgproject

What led to the initiation of the Svendborgproject?

- *Did you observe a need for the project?*
- *How did the idea originate?*
- *What enabled the project?*

Who were you aiming the SvenborgProject at?

- *Who were to benefit of it?*
- *Should the students achieve something?*
- *Specific student groups or grades?*
- *Should the parents achieve anything?*
- *Specific parent groups or classes?*
- *Should the schools achieve anything?*
- *Specific groups; managers or teachers*

Establishing the Svendborgproject

How were you planning on achieving the purpose of the Svendborgproject?

- *On what background did you expect the elements to meet the purpose?*
- *Were there any elements that you considered as more important than others in terms of accomplishing the purpose of the Svendborgproject?*

How were schools and teachers recruited?

- *Were all schools informed and invited to attend?*
- *How were the schools informed about the project (mail, meeting, telephone)?*
- *What information did the schools receive before choosing to participate?*

How many schools did you ultimately want to recruit?

- *Did you experience any restrictions regarding the recruitment of schools?*
- *What considerations did you have regarding the schools involvement and capacity?*

How many teachers did you ultimately want to recruit?

- *Did you experience limitations in relation to the recruitment of teachers?*
- *What considerations did you have regarding the teachers' involvement?*

Initiation of the Svendborgproject

How did you plan to initiate the Svendborgproject?

- *What role did the school leaders play?*
- *Did you experience that the school leaders were equipped for the task?*
- *What role did the teachers have?*
- *Did you find that the teachers were equipped for the task?*

Who did you think had the main responsibility for the initial implementation?

- *What was your role in the initial implementation process?*
- *Did you take special initiatives to ensure implementation?*
- *What role did the school promoters have?*
- *Has the responsibility mainly been with the municipality, the school management, school promoters or the teachers?*

How did you experience the school's response to the Svendborgproject?

- *How did you feel that interested schools responded?*
- *How did you experience that non-interested schools responded?*
- *How did school response affect the implementation process?*

How did you plan to follow the implementation process?

- *How did you follow up on the individual school process?*
- *What methods did you use (meetings, oral feedback, reports, questionnaires, white papers etc.)*
- *What was the idea behind the schools developing a individual strategy report on how they operated the Svendborgproject (for documentation of implementation?)?*
- *Did you expect the programme to be adjusted during or after implementation?*

Implementation of the Svendborgproject

Did you set goals for when implementation could be accepted?

- *Did you set a quality-score or a set of minimum requirements for the implementation?*
- *Did you set a criterion regarding teachers' participation in the professional development course?*
- *Did you set a criterion regarding the percentage of physical education lessons the students were receiving?*
- *Did you set a criterion regarding the use of the age-related training concept?*
- *Did you set a criterion regarding the level of intensity during physical education lessons?*
- *Did you set any other criterions?*

The adjustment of the Svendborgproject

To what extent has the project changed since it was initiated in 2008?

- *Has there been a change in the definition of the Svendborgproject?*
    - *Why?*
- *Have there been any changes in the vision the Svendborgproject?*
    - *Why*
- *Have changes occurred in the requirements of being part of the Svendborgproject?*
    - *Why?*
- *What was the basis for the revision of the concept as of 2012?*

What has contributed to adaption of the Svendborgproject?

- *What circumstances have made these changes possible?*
- *What restrictions have caused changes in the programme?*
- *What role has the research played?*
- *What role have the schools played?*
- *What role has politicians played?*

Maintenance of the Svendborgproject

What did you think was the most important thing about the project?

- *What is a story you tell others about the project?*

Have there been any particular challenges or resistance along the way?
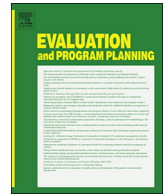
- *Can you give an example of this?*
- *How did these challenges affect the programme?*
- *How have the challenges affected your work with the programme?*

Are you aware of any threats that could affect the survival of the Svendborgproject?

- *Can you give an example of these threats?*
- *How are you dealing with these threats?*

Paper II

Using the RE-AIM framework to evaluate a school-based municipal programme tripling time spent on PE

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ABSTRACT

Documenting the implementation of effective real-world programmes is considered an important step to support the translation of evidence into practice. Thus, the aim of this study was to identify factors influencing the adoption, implementation and maintenance of the Svendborgproject (SP) – an effective real-world programme comprising schools to implement triple the amount of physical education (PE) in pre-school to sixth grade in six primary schools in the municipality of Svendborg, Denmark. SP has been maintained for ten years and scaled up to all municipal schools since it was initiated in 2008. The Reach, Effectiveness, Adoption, Implementation and Maintenance framework (RE-AIM) was applied as an analytic tool through a convergent mixed method triangulation design. Results show that SP has been implemented with high fidelity and become an established part of the municipality and school identity. The successful implementation and dissemination of the programme has been enabled through the introduction of a predominantly bottom-up approach combined with simple non-negotiable requirements. The results show that this combination has led to a better fit of programmes to the individual school context while still obtaining high implementation fidelity. Finally, the early integration of research has legitimated and benefitted the programme.

1. Introduction

Globally only a small proportion of school-aged children meet the physical activity (PA) recommendation put forward by the World Health Organization, stating that children should get at least one hour of moderate to vigorous PA a day (Hallal et al., 2012; Inchley et al., 2016; Kalman et al., 2015). This is alarming since inactivity in childhood has been associated with obesity (Strong et al., 2005) and negative health consequences relating to lifestyle diseases such as cardio vascular diseases and diabetes (Andersen, Hasselstrom, Gronfeldt, Hansen, & Karsten, 2004; Janssen & Leblanc, 2010). Therefore, the promotion of PA in children should be a public health priority. Schools have been identified as ideal arenas to promote PA, as they have the potential to reach children of all socioeconomic groups and most children spend a large proportion of their weekdays at school (Dobbins,

Husson, DeCorby, & LaRocca, 2013; Reis et al., 2016). However, translating and disseminating behaviour-related programmes into a real-world context such as schools is often a challenge and there is a need for evaluations with greater attention to the context and the practical implications of programmes (Gaglio, Phillips, Heurtin-Roberts, Sanchez, & Glasgow, 2014; Glasgow & Emmons, 2007; Heath et al., 2012; McGoey, Root, Bruner, & Law, 2015).

The RE-AIM framework (Reach, Effectiveness, Adoption, Implementation and Maintenance) has been developed to guide evaluations with a special focus on external validity, adding attention on the translation and dissemination of programmes (Glasgow, Vogt, & Boles, 1999). RE-AIM is a widely accepted framework and has already shown useful when evaluating real-world programmes with a special focus on the implementation of new practices in a school context (Austin, Bell, Caperchione, & Mummery, 2011; Estabrooks,
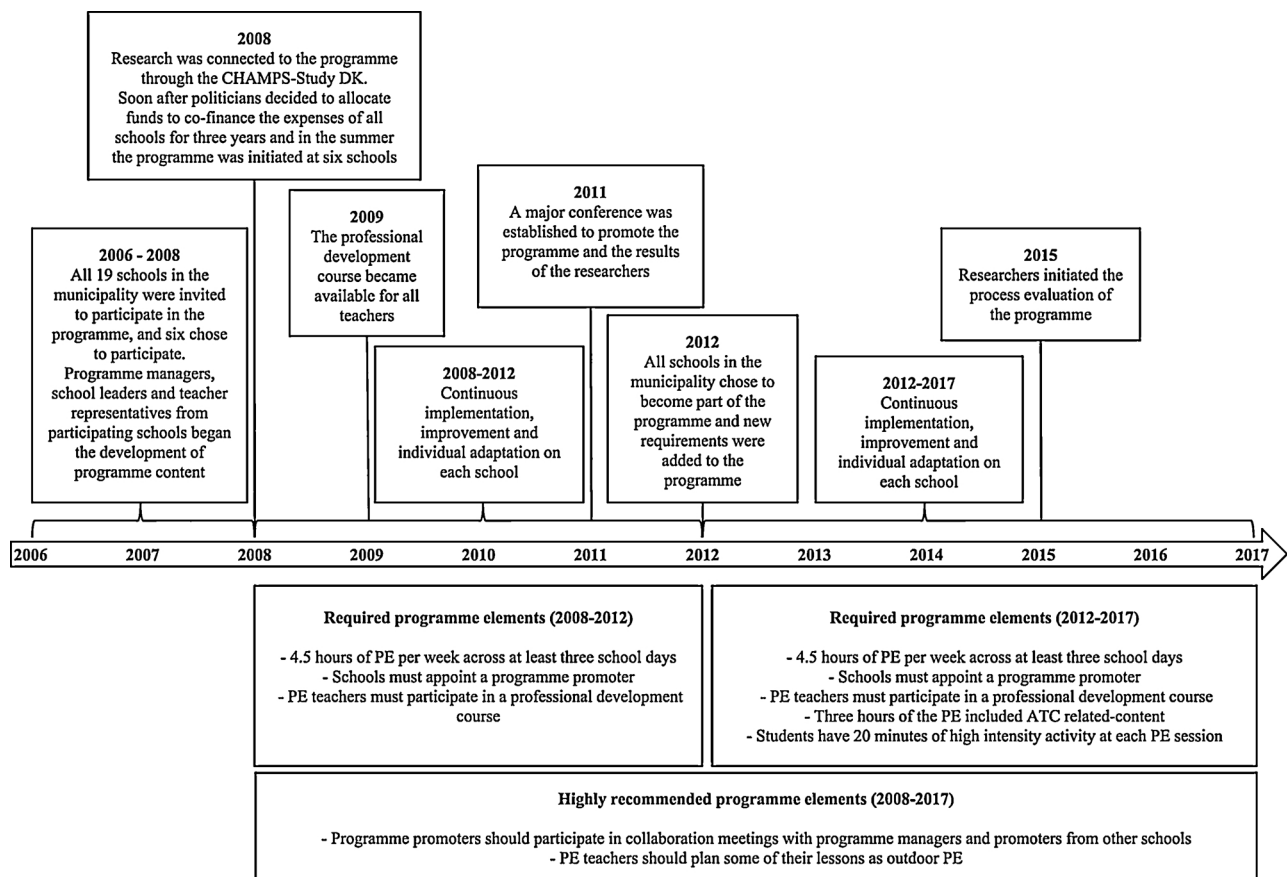
Fig. 1. Description of relevant timepoints and programme requirements of SP.

Dzewaltowski, Glasgow, & Klesges, 2003; Janssen, Toussaint, van Mechelen, & Verhagen, 2013; Smedegaard, Brondeel, Christiansen, & Skovgaard, 2017).

The Svendborgproject (SP) is real-world programme promoting PA in primary school focusing on implementing triple the amount of physical education (PE) in pre-school to sixth grade. The implementation of SP has resulted in students becoming more active during school time (Moller et al., 2014) as well as a decrease in incidents of overweight and obesity (Klakk, Chinapaw, Heidemann, Andersen, & Wedderkopp, 2013), a reduction of cardiovascular risk factors (Klakk, Andersen, Heidemann, Moller, & Wedderkopp, 2014) and improved fitness in students with low fitness levels (Rexen et al., 2014). Furthermore, SP has been maintained and subsisted over a period of nearly ten years, which clearly emphasises the value of evaluating the programme using the RE-AIM framework in order to enhance the external validity of the programme.

1.1. Aim

The aim of the present study is to apply the RE-AIM framework as an analytic tool to evaluate SP and identify important factors influencing the adoption, implementation and maintenance of SP.

2. Method

2.1. Programme description

SP has been developed, facilitated and sustained by the municipality of Svendborg, Denmark. When the planning of SP was initiated in 2006, all 19 public schools in the municipality were invited to co-develop the programme. The main focus of the programme was for schools to

implement triple the amount of PE. Prior to programme initiation all schools in the municipality and Denmark had two mandatory PE lessons – adding up to 1.5 h weekly. Ten schools showed interest, but only six had the capability (practically or economically) to prioritize the implementation of the additional amount of PE. Eventually six of the schools initiated the programme in 2008, implementing a relatively simple concept consisting of three required programme elements: (i) the students in pre-school to fourth grade were to receive 4.5 h of PE distributed across a minimum of three days a week at programme start-up, and gradually integrating the fifth and the sixth grade over the next two years; (ii) PE teachers had to participate in a professional development course based on an Age-Related Training concept (ATC), stressing the importance of training children in a biologically relevant manner to accord with their physical and physiological maturity (Bach & Eiberg, 2010; Pryce, Willeberg, Falkentoft, & Meyhoff, 2005); (iii) the schools had to assign a programme promoter (school staff member), who was to act as a link between their school and the programme managers. Besides these three requirements, two additional elements were highly-recommended for schools to implement: (i) programme promoters should participate in collaboration meetings with programme managers and promoters from other schools, and (ii) PE teachers should plan some of their lessons as outdoor PE. Overall, this aimed at students receiving an improved quality of PE and triple the amount of PE.

SP was developed and evolved independently of researchers, though researchers were initially allowed to follow the programme. This led to a substantial programme of research, the Childhood Health, Activity, and Motor Performance School Study Denmark (CHAMPS-study DK), being connected to SP. Through the CHAMPS-study DK a multifaceted quasi-experimental study, comparing SP schools and non-SP schools, was established in order to evaluate the effects on the physical health of
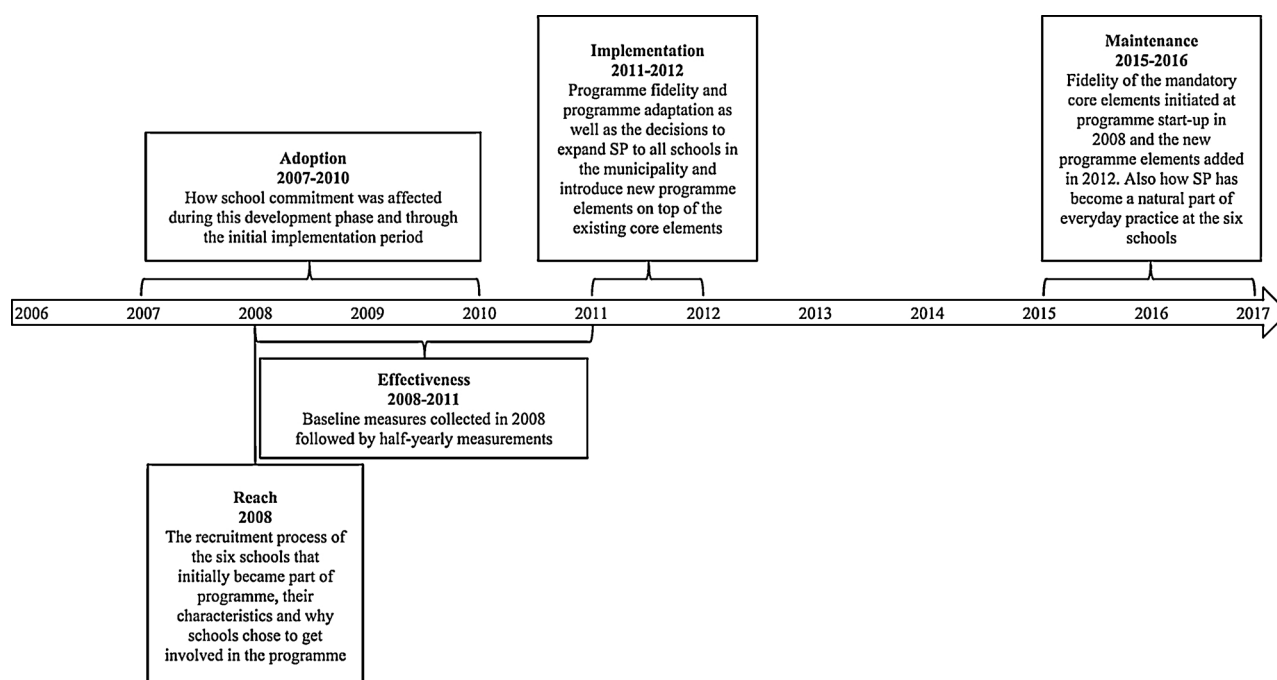
Fig. 2. Visualisation of how the various RE-AIM dimensions is applicated across the programme timeline.

children engaged in SP (Wedderkopp et al., 2012). Applying the research programme seemed appealing to the politicians of the municipality as it would document the effectiveness of the programme. Thus, in early 2008 politicians decided to allocate funds to co-finance the expenses of running the programme for all enrolled schools for three years. A timeline of SP covering the required and highly-recommended programme elements is illustrated in Fig. 1. (Supplementary description of the programme can be found in Appendix A).

2.2. RE-AIM

Using the RE-AIM framework, this study documents the process of SP from its inception and ten years into the programme. This historical perspective makes it relevant to address how SP has evolved over time (Fig. 1) and how the RE-AIM framework was applied to guide the analysis across this timeline (Fig. 2). Each of the RE-AIM dimensions and their outcome measures are defined below and in Table 1.

2.2.1. Reach

In the present study, the reach dimension reports on the characteristics of the six schools that initially became part of programme when SP was initiated at the schools in 2008. Although the main focus

in this study is the adoption, implementation and maintenance dimension, reach will be described to ensure the representativeness in relation to the number of the PE teachers and schools that were part of SP. School characteristics and representativeness is assessed through data from the Danish Database of National Statistics.

2.2.2. Effectiveness

Effectiveness of SP is reported elsewhere (Klakk et al., 2013, 2014; Moller et al., 2014; Rexen et al., 2014), thus, this dimension is not included in the present paper.

2.2.3. Adoption

Although six schools agreed to become part of the programme there was no guarantee that school management and PE teachers would actually adopt the programme. The adoption dimension reports on schools' commitment and relevant strategies introduced by programme managers and school heads in order to secure staff turnover and engagement. As schools were involved in programme development prior to programme implementation, the adoption dimension also focuses on how school commitment was affected during the developmental phase and through the initial implementation period. Hereby adoption reports on the period of 2007–2010 and will be documented through interviews

Table 1
Outline of the RE-AIM dimensions' model and outcome measures.

Dimension	Definition	Outcome measures
Reach	The characteristics and representativeness of schools in the overall target group who were eligible to participate in the programme.	- Number of eligible schools who participated - Characteristics of participating schools
Effectiveness	The effectiveness outcomes of the programme e.g. more physical activity and health promotion of children.	- This dimension is reported elsewhere, and not included in this paper[a]
Adoption	The commitment of participating schools regarding their decision to install the programme and factors influencing that decision.	- Commitment of participating schools - Factors influencing school engagement
Implementation	The extent to which schools implemented the programme as intended and adaptations made to the programme over time	- Degree of programme elements that were delivered as designed (fidelity) - Adaptations made to the programme
Maintenance	The extent to which the schools maintained programme implementation and the programmes ability to become an integrated part of daily practice.	- Degree of programme elements that were maintained over time - Factors influencing maintenance

[a] Klakk et al. (2014); Klakk et al. (2013); Moller et al. (2014); Rexen et al. (2014).

with programme managers, interviews with school heads and programme-related documents.

2.2.4. Implementation

The implementation dimension reports on programme fidelity at the six schools. Implementation fidelity was measured as in 2011 and indicates how the schools fulfilled the three programme requirements and the two highly-recommended elements (Fig. 1). Furthermore, the implementation dimension reports on the adaptation of the programme, which led to the extension of SP to all schools in the municipality and to new programme elements being added. The implementation dimension will be documented through programme manager interviews, school head interviews, teacher questionnaires and programme-related documents.

2.2.5. Maintenance

The maintenance dimension reports on fidelity, as in 2016. Fidelity will be reported in relation to the programme requirements and highly-recommended elements as described during start-up in 2008 (Fig. 1) in order to establish the degree to which SP still was operationalized at the six original schools nearly ten years after initiation. In addition, the maintenance dimension report on the degree to which new added programme requirements (Fig. 1) have been implemented and fulfilled at the six schools. Lastly, the maintenance dimension focuses on how SP has become part of everyday practice at the six schools. Maintenance will be reported through the use of programme manager interviews, school head interviews, teacher questionnaires and programme-related documents.

2.3. Design of this study

This study adopts a convergent mixed-method triangulation design (Greene, 2007) in order to identify important factors influencing the processes of adopting, implementing and maintenance of SP. Six sources of data have been collected: archival records, programme-related documents, semi-structured group interviews with programme managers, semi-structured single interviews and highly-structured interviews with school heads; and questionnaires aimed at PE teachers. Data sources covering the various RE-AIM dimensions in focus is outlined in Table 2.

2.4. Documents

Internal programme documents were included to describe the history and development of the programme. All the documents included are on public record (Dataset & Nielsen, 2017). The documents contained i) collaboration minutes (N = 21) describing the joint implementation process of programme managers and schools; ii) internal evaluations (N = 2) of the implementation process and an evaluation collating experiences from all participant schools on how to implement the programme; iii) individual school strategy reports (N = 5) describing how each school implemented the programme during the initial years. Altogether, documents provided experiences covering the period of 2008–2016. Additional data included archival records from the municipality reporting on school statistics and from Statistics Denmark containing national population data on the size of Danish municipalities, parents' level of education, disposable household income and student quotient in school classes.

2.5. Interviews

Two group interviews with municipal programme managers were conducted and six single interviews with school heads. Two different interview guides were created, one for programme manager and one for school heads (example can be found in Appendix B in Supplementary material). Both interview guides were based on the reach, adoption, implementation and maintenance dimensions of the RE-AIM framework. The questions were framed in an open-ended manner within the context of the programme and were based on the language and terms presented in the programme documents.

Interview participants were chosen through purposeful sampling (Kelly, 2010), which ensured key respondents with sufficient knowledge of SP and coordination activities across the six participating schools. All respondents received a letter of information prior to the interviews, explaining the purpose. All respondents signed written informed consent. All interviews were audio-recorded and performed by the first author (JVN) in private rooms at the workplace of the interviewees.

2.5.1. Programme managers

Five programme managers have been engaged in the programme over the last ten years. Three of the five programme managers were

Table 2
Description of the various data-sources used in this study, the time data was collection and how the various data-sources inform on the RE-AIM dimensions.

Data sources	Data collection period	RE-AIM dimension (data representation year)			
		Reach (2008)	Adoption (2007–2010)	Implementation (2011–2012)	Maintenance (2015–2016)
Semi-structured group interviews with programme managers (N = 2)	2015	–	X	X	X
Semi-structured single interviews with sitting school heads (N = 3)	2016–17	–	X	X	X
Highly-structured single interviews with sitting school heads (N = 3)	2016–17	–	–	–	X
Semi-structured single interviews with former school heads (N = 3)	2016–17	–	X	X	–
Highly-structured single interviews with former school heads (N = 3)	2016–17	–	–	X	–
Teacher questionnaires	2016	–	–	X[a]	X[b]
Programme-related documents	2014	–	X	X	–
- school strategy reports (N = 5)		–	–	X	–
- internal evaluations (N = 2)		–	X	X	X
- collaboration minutes (N = 21)					
Archival records on national and school statistics	2008	X	–	–	–

[a] Based on answers from 23 PE teachers regarding implementation (see Section 2.3 Questionnaires).

[b] Based on answers from 35 PE teachers regarding maintenance (see Section 2.3 Questionnaires).

invited and agreed to participate in two face-to-face semi-structured group interviews. The two programme managers not included in the study sample were only temporarily involved in the programme during the initial years and were considered not to possess comprehensive insight into SP. Two of the managers included were still working on the programme – one was part of the development of the programme, the other was employed a year into the programme, and both had been a central workforce of the programme. The third manager was no longer affiliated with the municipality but had been the one to introduce the idea and was considered the founder and initial driving force of the programme. Group interviews were chosen, as it was deemed that the interviewees could support each other in recollecting the process since programme start-up in 2008. Each group interview lasted approximately 90 min.

2.5.2. School heads

In collaboration with one of the active programme managers, a list of former and current school heads, deputy heads and heads of departments across the six schools was created. School heads most likely to yield relevant and useful information due to their current or former engagement to the programme were highlighted and invited to participate in the study. In some cases, deputy heads were chosen to take part, if they were assessed to have better insight into the programme and the implementation process than the head of their school. School heads were interviewed individually, as they represented different schools and could each provide different perspectives and nuances of the implementation process.

Of the seven heads invited, six agreed to participate. Initially a short highly-structured interview (approximately 10 min) was performed to determine if programme elements were delivered as designed (fidelity). The highly-structured questions were sent to the respondents prior to the interview. Immediately after the highly-structured interview, a 45-min semi-structured interview was conducted to cover the process of adopting, implementing and maintaining the programme. The two interview methods were combined in a single visit in order to minimize disruption for the respondents and to allow the highly-structured interview to provide a basis for the subsequent more open interview. Two of the interviewees were acting as school heads and three had been school heads at an SP school during the project's initiation in 2008 but were now either retired or had moved to a new school in another municipality. The remaining head occupied a post as deputy head and had done so since the start of the programme.

2.6. Questionnaires

A questionnaire to determine to which degree programme requirements and highly-recommended elements (Fig. 1) were delivered as designed (fidelity) were developed for PE teachers. The questionnaire was designed to measure both implementation fidelity and maintenance fidelity. The questionnaire was developed based on a list of identified programme elements and implementation strategies. The list was developed by the first author (JVN) through analysis of programme manager interviews and programme documents and was approved to comprise fidelity of the programme by the sitting programme managers.

Several steps were taken to heighten the content validity of the questionnaire. Initially the questionnaire was reviewed by the second author (TS) and last author (HK), who had in-depth knowledge of both the RE-AIM framework and SP. Secondly programme managers were asked to review all questions in relation to their ability to capture programme fidelity as they had detailed knowledge of programme content and structure. The questionnaire was also adapted to the target group by having two PE teachers correct any ambiguous or difficult questions. The two PE teachers had no connection to SP and were solely involved to ensure that the questions were phrased to fit the target group, thereby making it more likely for PE teachers to understand and answer the questions.

The questionnaire was designed and collected electronically through the survey system SurveyXact (example can be found in Appendix C in Supplementary material). The use of electronic surveys made it possible to activate additional questions on specific answers, thereby ensuring that participants did not receive irrelevant questions – e.g. if teachers answered that they had participated in the professional development course, they would get additional questions about the usability of the course. The full questionnaire contained 86 items rated either in yes/no answers or on a 4-point Likert scale ranging from agree to disagree. The 86 items covered four overall themes: a) general information regarding employment, b) working at a school taking part in SP, c) content and structure of PE lessons, and d) the professional development course. At the end of each theme teachers were also invited to make any supplementary comments to their answers. Finally, the questionnaire study was presented to all school heads, and they were given the opportunity to submit objections and proposals for its distribution. There were no objections, and the questionnaire was distributed by the school heads to all teachers who had delivered PE lessons at their individual school during the programme timeline (Fig. 1). The questionnaire was online for three weeks.

School heads identified 46 PE teachers across the six schools. Of these, 35 (76%) answered the questionnaire, all of these reporting on maintenance fidelity. The only teachers invited to answer questions relating to the implementation fidelity were those who reported that they were employed at their school and had been teaching PE during the implementation fidelity measuring point in 2011. There were 23 teachers who fitted this criterion and who answered the questions regarding implementation fidelity. Both answers on implementation and maintenance represents and is equal distributed across all six schools.

2.7. Data analysis

2.7.1. Qualitative data analysis

Programme manager and school head interviews were transcribed verbatim and names were anonymized and analysed together with documents using qualitative content analysis (Schreier, 2014). The first author (JVN) thoroughly familiarized the document and interview data prior to the coding of the material. This familiarization was done by reading the material while taking notes and identify overall core patterns in the data. Based on these core patterns, a coding-frame related to each of the RE-AIM dimensions in question was developed. Subsequently, the first author (JVN) trial-coded a large portion of both the document and interview data according to the coding-frame. The results from the trial-coding were discussed among authors in order to reach consensus on which information related to which RE-AIM dimension. Following this, the first author (JVN) adjusted and refined the coding-frame. Subsequently all data that had been used in the trial-coding were re-coded with the new coding-frame together with the rest of the interview and document data. In the final step of the analysis the first author (JVN) thoroughly read the coded material and selected main quotations relating to factors that influenced the adoption, implementation and maintenance of SP to prepare the findings for presentation. Examples of quotations from both interviews and documents across RE-AIM dimensions can be found in Appendix D.

2.7.2. Quantitative data analysis

STATAv15 were used to handle questionnaire data and produce descriptive statistics, proportions on implementation and maintenance fidelity. Due to the paucity of responses, Likert scale values were collapse resulting in two categories of "agree" and "disagree".

2.8. Ethical considerations

Written informed consent, also containing consent for publication, was collected from all participants at the beginning of each interview. The programme of research was approved by the Danish Research Ethics Committee (Project-ID: S-20080047 and S-20140105).

Table 3
Results related to each outcome measure of the RE-AIM dimensions.

Dimension	Outcome measures	Results
Reach	- Number of eligible schools who participated	- All 19 schools in the municipality were eligible and 6 chose to participate in SP
	- Characteristics of participating schools	- Municipality size and average household income matched the Danish normal. Schools were either located in rural (n = 4) or urban-suburban (n = 2) areas. Child per teacher ratio was lower (18.7) than the Danish average (20.1)
Adoption	- Commitment of participating schools	- Participating schools found PA as something that was already a part of their individual school culture
	- Factors influencing school engagement	- To diminish a top-down approach school representatives were included in the development of the programme while programme managers delivered close supporting dialogue. Additionally, teachers were promised a professional development course to aid the implementation.
Implementation	- Degree of programme elements that were delivered as designed (fidelity)	- Required and highly-recommended elements were all implemented with high fidelity.
	- Adaptations made to the programme	- Three years into the programme two additional requirements were added and all schools in the municipality became part of the programme.
Maintenance	- Degree of programme elements that were maintained over time	- Three requirements showed high fidelity and two showed mediocre fidelity. The two showing mediocre fidelity were participation in the professional development course (26/35) and PE lessons consisting of minimum three hours of ATC-related content (17/35). The two highly-recommended elements both showed high fidelity.
	- Factors influencing maintenance	- The programme has become an integrated part of the schools' identity. At the municipality level, the linkage to research provided legitimacy and political support of the programme.

3. Results

The present study has analysed SP and the outcome measures of each of the RE-AIM dimensions in question in presented in the following sections and summarized in Table 3.

3.1. Reach

Of the six schools that initiated the programme in 2008, four were located in rural areas and two in urban-suburban areas. Of the non-participating schools, five were rural and eight urban or suburban. There was no significantly difference in parental education level between participating and non-participating schools. In Denmark, public schools are funded from taxes and organized by the local authorities in the municipality. Data from the Danish Database of National Statistics (www.statistikbanken.dk, 2017) show that the population of the Svendborg municipality was 59,138 and the average disposable household income was 190,708 Danish kroner (25,500 Euro) at programme initiation in 2008. In Denmark, the average size of municipalities was 55,437 people and average disposable household income was 195,039 Danish kroner (26,200 Euro). No national data could be located on teacher/student ratios in 2008, but in 2009 the average number of children per teacher was 18.7 in Svendborg and at the national level it was 20.1.

3.2. Adoption

Interviews with programme managers and school heads reveal that all six participating schools found PA and PE a meaningful element and something that was already a part of their individual school culture during the developmental phase.

> The school has always had a strong physical activity profile, We have committed physical education teachers and good facilities for sports activities. We have made a clear strategy regarding our physical education i.e. a guide to teachers, students and parents, so everyone knows the common guidelines regarding physical education at our School. [strategy report - school 3]

By including schools that were interested in the programme and inviting teacher and school leader representatives to develop the programme, managers wanted to diminish a top-down approach. The overall idea was to tailor the programme to the school context. However, programme manager interviews reveal that the teachers involved in the programme development phase were sceptical at first. Teachers were focused on practicalities, such as whether they would

have enough space in the gym, would need additional equipment or if time could be allocated for the additional PE. Programme managers engaged in close dialogue with the teachers, trying to get them to think more innovatively e.g. how they could use the facilities already available but in new ways. Through these discussions, teachers realised that the added PE would enable them to give greater attention to students with difficulties, as SP would ensure that they had time to focus on a learning perspective and go beyond just doing activities. Programme managers report that, once teachers realized this potential, they became highly committed to SP.

> … there were not much enthusiasm in the beginning… eventually it came… but it was a required condition to have those more or less frustrating talks about content and the implications of the programme… because we did not define the programme in advance… we were to develop it together [with the teachers]… You have to be patient in that process… [Programme manager 3]

School head interviews reveal that the co-involvement in the early stages of the programme was important for the programme to be implemented. All school heads also indicate the importance of demonstrating a general positive attitude and support for the programme to teachers and parents. Interviews with school heads show that many of the schools and teachers found it motivating to have the researchers following the children and documenting whether the programme and their PE lessons were effective.

> Then came the entire research programme… it was exciting for the teachers as they were eager for their students to be measured again… To see whether they could track any progress… it was a different… a special school day… I think it was a boost, they were really excited… [School head 2]

3.3. Implementation

Implementation reports on the fidelity of required and recommended elements (Fig. 1) in 2011. Table 4 shows implementation fidelity of both required and recommended elements. Additionally, implementation also reports how the programme has been adapted over time.

3.3.1. Additional PE over a minimum of three days

Document analyses and interviews with school heads show that the 4.5 h of PE were scheduled at all schools from pre-school to 6th grade (Table 4). Interviews with school heads also reveal that schools handled the implementation of the required elements differently, which resulted

Table 4
Implementation fidelity (2011).

Requirements	Reporting data source		
	Documents	Interviews	Questionnaires
4.5 h of PE minimum three days a week	All schools	All schools	21/23 teachers agree
PE teachers have participated in professional development course	–	–	22/23 teachers had participated
Schools have assigned a programme promoter	All schools	All schools	–
Highly-recommended elements			
Planning outdoor PE	All schools	All schools	23/23 teachers agree
Programme promoters participate in collaboration minutes	All schools	All schools	–

in some schools choosing to have the 4.5 h divided over three days a week while others chose to arrange PE every day. However, teacher questionaries' show that two teachers disagreed to provide 4.5 h of PE a week (Table 4). These teachers point out that time spent on changing and showering should not be included in the actual time being physically active during PE. Therefore, the amount of active PE could, according to some teachers, have been less than 4.5 h.

3.3.2. Participation in the professional development course

Teacher questionnaires show that all but one teacher had participated in the professional development course (Table 4). Documents and interviews with school heads show that having PE teachers participate in the course was a high priority for all schools.

3.3.3. Appointing a programme promoter

Documents and interviews with school heads reveal that all schools chose a programme promoter prior to programme initiation (Table 4). Although some schools changed promoter during the years, all schools had a programme promoter assigned during the whole implementation process. PE teachers were chosen as programme promoters at some schools and at others the school head acted as promoter. In some cases, school heads and a PE teacher chose to act as programme promoter simultaneously.

3.3.4. The highly-recommended elements

Documents and interviews showed that programme promoters participated in collaboration meetings with the programme managers and the promoters from the other schools (Table 4). These collaboration meetings helped the flow of information from schools to programme managers and vice versa. Programme managers and school heads also made it clear that the promoters were a driving force aiding the implementation of the programme. Regarding outdoor PE, documents show that all schools arranged outdoor PE during all seasons (Table 4). This is supported by the teacher questionnaires, which show only one teacher disagreeing on planning outdoor PE. Both documents and

interviews show that the use of outdoor PE was essential to cope with the intense pressure on facilities when tripling the amount of PE.

3.3.5. Programme adaptation

In 2011, programme managers and the participating schools conducted a systematic internal evaluation of SP, showing enthusiasm and positive feedback from all parties. At the same time the municipality of Svendborg held a major conference promoting the programme and highlighting the research findings (Fig. 1). Positive responses from participating schools alongside the research results showing SP to be effective dominated the discussion as to whether it was possible to include more schools in the programme. Programme manager interviews and documents revealed that there were three schools in particular among those set up as control schools by the researchers that were eager to become part of the programme. Programme managers used this momentum to consolidate political support from the city council, which resulted in all schools in the municipality once again being invited to become part of the programme. All schools said yes. Alongside the inclusion of the new schools, an adapted concept was introduced adding two new programme elements to the original three – i) three hours of the PE must include ATC-related content and ii) students would get 20 min of high intensity activity in each PE session (Fig. 1). Programme manager interviews and documents reveal that these adaptations were very much based on feed-back from school promoters, who proposed more detailed descriptions for how SP should be adapted. During this process, programme managers also consulted with the researchers and tried to adopt their recommendations in the new programme requirements.

> We were evaluating the programme… and we actually got feedback from the school promoters suggesting that the programme might have gotten a little diluted over time… because in that first concept they [the requirements] were rather vaguely described… So, they actually asked us to describe the programme requirements in more detail… and in this process of evaluating what had been good and bad we also adopted the research results… [Programme manager 3]

Table 5
Maintenance fidelity (2016).

Requirements	Reporting data source		
	Documents	Interviews	Questionnaires
4.5 h of PE minimum three days a week	All schools	All schools	30/35 teachers agree
PE teachers have participated in professional development course	–	–	26/35 teachers have participated
Schools have assigned a programme promoter	All schools	All schools	–
Students have at least 20 min high intensity activity	–	–	33/35 teachers agree
PE consist of minimum three hours of ATC-related content	–	–	17/35 teachers agree
Highly-recommended elements			
Planning outdoor PE	All schools	All schools	35/35 teachers agree
Programme promoters participate in collaboration minutes	All schools	All schools	–

3.4. Maintenance

Maintenance reports on the fidelity of required and recommended elements ([Fig. 1](#)) in 2016. [Table 5](#) shows maintenance fidelity of original and new requirements as well as recommended elements. Additionally, maintenance reports how the programme became an integrated part of daily school practice.

3.4.1. Maintenance fidelity

Documents and highly-structured interviews with school heads show that all six schools maintained the 4.5 h of PE divided across a minimum of three days a week ([Table 5](#)). All schools state that they are still aware that new PE teachers must participate in the professional development course, but teacher questionnaires show that only 26/35 have participated in the course ([Table 5](#)). One of the school heads reveals that this is an ongoing challenge because new PE teachers are being appointed without having the necessary educational time to join the professional development course. Documents and highly-structured interviews with school heads show that all schools still have a programme promoter assigned, and that they still attend programme collaboration meetings ([Table 5](#)). Questionnaires show that all PE teachers include outdoor facilities in their PE lessons all seasons ([Table 5](#)). Questionnaires also shows that the students generally receive the required 20 min of high intensity activity as 33/35 of teachers agree on this ([Table 5](#)). However, programme collaboration minutes reports that the teachers find it difficult to assess whether the students take part in high intensity activity or not. Regarding the requirement of PE teachers delivering a minimum three hours of ATC-related content, it is noticeable that only 17/35 of the teachers reports doing so ([Table 5](#)). [Table 6](#) shows that several of the teachers who disagree on planning the required ATC had not participated in the professional development course, and so had not been introduced to ATC. The two teachers reporting that they perform three hours of ATC but had not attended the course ([Table 6](#)) reports that they use ATC based on material they have been given by their colleagues.

3.4.2. An integrated part of daily practice

At the teacher level, questionnaires report that 30/35 of the teachers are pleased that their school is committed to being part of the programme. At the school head level, interviews reveal that SP has become an integrated part of the schools' identity, their daily practice and a natural part of their planning of the school year.

> When the programme has existed for six, seven, eight years, it becomes part of everyday life… I do not believe that anyone are thinking "We are in the Svendborgproject"… It is incorporated into the schools' way of planning… There is no question about that… [School head 3]

Programme manager interviews stress that the research results have given the programme legitimacy and political support, which have eventually resulted in SP progressing from being ad hoc funded to now having a robust economic base. Furthermore, the political goodwill of SP has resulted in new programmes being created in its image, for example in increased attention given to movement and its implementation in a similar programme for children in day-care.

Table 6
Teacher participation in the professional development course and if they plan three hours of ATC-based PE.

Participated in the course	Planning three hours of ATC-based PE			
	Agree	Disagree	Do not know	Total
Yes	15	7	4	26
No	2	6	1	9
Total	17	13	5	35

> These days we are writing the budget for the coming year… And some new programmes, like more physical activity for children in day-care, but also our talent development programme… We stress that the programmes are related to the Svendborgproject… So, the Svendborgproject has actually become something that can help start other programmes… give some goodwill at the political level when these new programmes are related to it [the Svendborgproject]… [Programme manager 2]

4. Discussion

SP have demonstrated how a rather simple concept is able to be adopted by schools and teachers, be implemented with high fidelity and to be maintained over a period of 10 years in a real-world setting. Furthermore, the programme has become an established part of the municipality and the identities of schools. Central factors estimated to have crucial influence for the success of SP will be discussed further below.

4.1. The commitment and involvement of schools

The results show that all the six schools that chose to participate in SP had an initial interest in the promotion of PA. This has been pointed out by others as an advantage in securing implementation and maintenance of PA programmes, since it ensures that they will be better suited to the individual school context and that schools already having an awareness of how to integrating PA ([Durlak & DuPre, 2008](#); [Forman, Olin, Hoagwood, Crowe, & Saka, 2008](#); [Janssen et al., 2013](#); [Naylor et al., 2015](#); [Pearson et al., 2015](#)). Furthermore, the active participation of schools and a bottom-up approach during SP have been successful strategies in securing this contextual fit. This is supported by others reporting that involving teachers in the planning and decision process help programmes to fit existing school practice and increase the probability to increase maintenance ([Sulz, Gibbons, Naylor, & Higginsb, 2016](#)). Programme managers havebeen trying to achieve the right mix of having a top-down approach (ensuring that schools followed programme requirements) and a bottom-up approach (involving schools in the programme decisions and finding solutions that would fit a school context). To promote this bottom-up approach, programme managers involved teacher representatives in the early stages of developing the programme. Initially teacher representatives showed scepticism towards SP. This could very well be due to the programme not being specific and clear about how it should be implemented, which has proved to be important for teachers if they are to accept new programmes ([Langille & Rodgers, 2010](#); [Pearson et al., 2015](#)). Studies have shown that, when introduced to new programmes, teachers have a special concern about additional work-load and the time they have to put in ([Adamowitsch, Gugglberger, & Dur, 2017](#); [Lytle, Ward, Nader, Pedersen, & Williston, 2003](#); [Naylor et al., 2015](#); [Pearson et al., 2015](#); [van Nassau et al., 2016](#)) and worry about the risk of having to down-prioritize academic goals in order to meet new requirements ([Keshavarz, Nutbeam, Rowling, & Khavarpour, 2010](#); [Lytle et al., 2003](#)). This study indicated that some scepticism should be expected when involving teachers in the early stages of programme development and it is imperative for programme managers to engage in dialogue with the teachers. Through supportive dialogue, programme managers eventually helped secure teacher dedication and enthusiasm for SP. Programme managers continued this dialogue and shared decision-making with schools through regular collaboration meetings with school promoters from all six schools. This collaboration established organizational support for the schools during both the adoption and the implementation stages of SP and it is generally deemed a facilitating factor for implementation ([Durlak & DuPre, 2008](#); [van Nassau et al., 2016](#)).

4.2. Fidelity of programme elements

The commitment and motivation of school heads has generally been noted as crucial for successful implementation (Forman et al., 2008; Ingemarson, Rubenson, Bodin, & Guldbrandsson, 2014; Langille & Rodgers, 2010; Masse, Naiman, & Naylor, 2013; van Nassau et al., 2016), and is especially highlighted as important in the adoption of school-based programmes (Janssen et al., 2013; Langille & Rodgers, 2010; van Nassau et al., 2016). The results of this study also emphasise the importance of school management's commitment during the adoption stage, as school heads aided the implementation of SP by promoting the programme at teacher and parent level. Other studies often identify teachers as the key implementers, as they are the ones delivering a programme with a theoretical base, involving an additional focus in their existing lessons or the development of new content (Bice, Brown, & Parry, 2014; Campbell et al., 2015; Hall et al., 2014; Howie et al., 2014; Janssen et al., 2013; Lytle et al., 2003). In SP, however, the original concept was fairly simple and only included requirements that school heads were able to implement – scheduling the additional PE, appointing a programme promoter and deciding when the PE teachers could attend the mandatory professional development course. This meant that the original SP concept did not require PE teachers to change their existing lessons, nor were teachers required to develop new content based on a predetermined framework or theory. Thus, school heads can initially be identified as the key implementers of SP, which presumably renders their dedication and support even more central to securing successful implementation and maintenance fidelity. Still, it is important to emphasise that programme managers and school heads, in alignment with the experiences of others (Durlak & DuPre, 2008; Langille & Rodgers, 2010; McIsaac, Read, Veugelers, & Kirk, 2017), deemed the support of teachers and programme promoters as important in ensuring the maintenance of the implemented structures and the overall quality of the additional PE activities.

4.3. Upholding programme fidelity over time

In 2012, SP was evaluated and the concept was adapted, leading to two additional requirements containing more specific descriptions of the content of the added PE (Fig. 1). Adaptation of concepts has been associated with positive results (Durlak & DuPre, 2008), and, as the new specifications were requested by school promoters (representing the teachers), it can be assumed that there was an incentive for implementing these new requirements. However, teachers report that the requirement of three hours of ATC in the PE lessons presented some difficulties when it came to implementation. This could be due to teachers still not having participated in the professional development course and simply not having the basis from which to plan ATC into their PE lessons. If correct, this would underline the importance of supporting teacher practices and of qualification courses as a key factor for securing implementation fidelity (Adamowitsch et al., 2017; Durlak & DuPre, 2008; Forman et al., 2008; Naylor et al., 2015). However, teachers that had participated in the professional development course also reported difficulties in implementing the added attention to ATC. This might be due to ATC only being recommended as a teacher's aid until the new requirements were introduced, and teachers may not directly have used ATC, or at least not to such an extent as the new requirements demanded. In other studies, it has proven effective to let providers having implementation difficulties participate in training courses once more (Durlak & DuPre, 2008), and it might be fruitful for schools and programme managers to establish brush-up courses as a supportive element for teachers when adapting programme content.

Continuous adaptation of programmes to fit school needs can lead to better implementation. However, it is important to monitor programme adaptation and how it affects programme success (Durlak & DuPre, 2008), for the results of this study also suggest that the introduction of more stringent requirements can have a negative impact

on fidelity if the supporting structures, such as solid programme co-ordination and a professional development course, are not in place or adjusted correspondingly.

4.4. Research linking to practice

Results show that the programme has been heavily influenced by the research associated with it, which affected programme adherence. This positive influence has been mentioned by others and support the idea that the involvement of research partnerships may aid school dedication and help to ensure implementation and maintenance (Forman et al., 2008; Howie et al., 2014; Lytle et al., 2003; McKay et al., 2015). At the school level, research showed that the schools' work was paying off which boosted motivation in favour of SP. Likewise the results of research had a crucial influence on the political support for SP, leading to its extension to all schools in the municipality and to the decision to secure programme funding. This supports the notion that research can help secure political backing, which is vital to uphold the programme's infrastructure and secure programme maintenance, fidelity of required elements, and programme expansion (McKay et al., 2015). Lytle et al. found that programmes initiated through research maximized facilitators and minimized barriers when adopting programmes. However, when research left the schools, the infrastructure also left, and schools were forced to downscale or eliminate elements of the programme (Lytle et al., 2003). It is noticeable that SP has been initiated, developed and facilitated by the municipality and schools of Svendborg, making the programme self-governing. This suggests that cooperation between research and practice can benefit both parties, as programmes like SP can gain support at both school and political level, whereas researcher can obtain valuable knowledge on how to improve and translate evidence-based programmes into effective practice by following these real-world programmes (Durlak & DuPre, 2008; Gaglio et al., 2014; Glasgow, 2013; Green, 2008; Lobb & Colditz, 2013).

4.5. Strengths and limitations

We recognize that this study has limitations. Generally, it would have been better to document the implementation process from programme initiation in 2008 and to have synchronised the measurement of fidelity with efficacy measures. As the evaluation of this study describes processes dating back several years, interviews and questionnaire data could contain some degree of recall bias. Also, we cannot guarantee that the results might have been more objective or nuanced if data had been gathered at an earlier stage, before the programme was deemed a success. However, to strengthen our empirical foundation, we used various qualitative and quantitative data sources to ensure that each of the adoption, implementation and maintenance dimensions was supported by a second data source (Table 2).

One of the strengths of this study is the extensive focus on implementation processes and the contextual descriptions of SP. This focus, set alongside the fairly simple programme requirements of SP, should improve the possible transferability to other schools or municipalities. However, it is important to mention that the results of this study only record the promotion of PE and are therefore not necessarily applicable to promoting PA in other forms. If PA is to be implemented during recess playtime or integrated into academic subjects (such as maths), different types of implementation concerns may possibly become relevant.

Finally, it is important to acknowledge that the present study only represents teachers through questionnaires. Additional research is needed centring on teacher, children and parents' perspective when implementing these real-world programmes.

4.6. Lessons learned

One lesson learned from this study is that introducing a relative

simple concept (implementing three times more PE in primary schools, having a school promoter and having PE teachers attend a professional development course) to six of nineteen schools in a municipality has the potential to be successfully implemented, to be extended into additional schools and to become a part of the municipality's main branding strategy.

Another lesson learned is, that having interested schools achieve success with the programme helps to establish the foundation for political support and to develop strategies that can aid programme implementation at other schools. These supportive structures and practical suggestions from fellow schools regarding the implementation of the programme could very well be valuable resources for schools with less interest or experience regarding PA.

The final lesson learned is that even though the research has not been an active part of the decision-making, our results indicate that the research linkage was crucial and had an impact on various stakeholders. In SP, the research aided the initiation and sustainability of the programme and motivated teacher dedication and dissemination to the rest of the schools in the municipality.

5. Conclusion

This study provides description and documentation on the process of adopting, implementing and maintaining an effective real-world programme promoting more PE in primary school. When initiating school-based programmes, it might be beneficial for health promoters and politicians to introduce a bottom-up approach combined with simple non-negotiable requirements. It seems that this balance of bottom-up and top-down leads to a better fit of programmes to individual school context while still obtaining high implementation fidelity. However, in the aim of continually adapting the programme to fit the needs of the school, it is important to ensure that the supportive structures adapt accordingly to achieve fidelity. The linkage to research can benefit programme implementation at different levels at different stages and help to ensure the decision to initiate, expand and maintain programmes.

Competing interests

The authors declare that they have no competing interests.

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Appendix A. Supplementary data

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Appendix A: The TIDieR (Template for Intervention Description and Replication) checklist*

TiDieR

Template for Intervention Description and Replication

Item number	Item	Where located **	
		Primary paper (page or appendix number)	**Other** † (details)
1.	**BRIEF NAME** Provide the name or a phrase that describes the intervention.	see below at page 3	†____
2.	**WHY** Describe any rationale, theory, or goal of the elements essential to the intervention.	see below at page 4	†____
3.	**WHAT Materials:** Describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers. Provide information on where the materials can be accessed (e.g. online appendix, URL).	see below at page 5	†____
4.	**Procedures:** Describe each of the procedures, activities, and/or processes used in the intervention, including any enabling or support activities.	see below at page 6	†____
5.	**WHO PROVIDED** For each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given.	see below at page 7	†____
6.	**HOW** Describe the modes of delivery (e.g. face-to-face or by some other mechanism, such as internet or telephone) of the intervention and whether it was provided individually or in a group.	see below at page 8	†____
7.	**WHERE** Describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features.	see below at page 9	†____
8.	**WHEN and HOW MUCH** Describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose.	see below at page 9	†____

9. TAILORING

If the intervention was planned to be personalised, titrated or adapted, then describe what, why, when, and how.

see below at page 10 _____ †____

10.‡ MODIFICATIONS

If the intervention was modified during the course of the study, describe the changes (what, why, when, and how).

see below at page 11 _____ †____

HOW WELL

11. Planned: If intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them.

see below at page 11 _____

12.‡ Actual: If intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned.

see below at page 11 _____

** **Authors** - use N/A if an item is not applicable for the intervention being described. **Reviewers** – use '?' if information about the element is not reported/not sufficiently reported.

† If the information is not provided in the primary paper, give details of where this information is available. This may include locations such as a published protocol or other published papers (provide citation details) or a website (provide the URL).

‡ If completing the TIDieR checklist for a protocol, these items are not relevant to the protocol and cannot be described until the study is complete.

* This checklist has been used in conjunction with the TIDieR guide (see *BMJ* 2014;348:g1687) which contains an explanation and elaboration for each item.

* The focus of TIDieR is on reporting details of the intervention elements (and where relevant, comparison elements) of a study. Other elements and methodological features of studies are covered by other reporting statements and checklists and have not been duplicated as part of the TIDieR checklist. When a **randomised trial** is being reported, the TIDieR checklist should be used in conjunction with the CONSORT statement (see www.consort-statement.org) as an extension of **Item 5 of the CONSORT 2010 Statement.** When a **clinical trial protocol** is being reported, the TIDieR checklist should be used in conjunction with the SPIRIT statement as an extension of **Item 11 of the SPIRIT 2013 Statement** (see www.spirit-statement.org). For alternate study designs, TIDieR can be used in conjunction with the appropriate checklist for that study design (see www.equator-network.org).

1. Brief name

The Svendborgproject is a real-world programme implementing triple the amount of physical education in pre-school to sixth grade in six of nineteen primary schools in

the municipality of Svendborg, Denmark

Please also see abstract and section '2.1 programme description' in the manuscript

† : information is also described in our article: Nielsen JV, Klakk H, Bugge A, Andreasen ML and Skovgaard T: *Implementation of triple the time spent on physical*

education in pre-school to 6th grade: a qualitative study. Currently undergoing review in *Evaluation and programme planning*

† : information is also described in the CHAMPS-study DK protocol article: Wedderkopp, N., Jespersen, E., Franz, C., Klakk, H., Heidemann, M., Christiansen, C.,

Moller, N.C., & Leboeuf-Yde, C. 2012. *Study protocol. The Childhood Health, Activity, and Motor Performance School Study Denmark (The CHAMPS-study DK)*.

2. Why

SP has been developed, facilitated and sustained by the municipality of Svendborg, Denmark. The main focus of the programme was for schools to both improving the quality of physical education (PE) and implement tripling the amount of PE in public schools.

Please also see section '2.1 Programme description' in the manuscript.

† : information is also described in our article: Nielsen JV, Klakk H, Bugge A, Andreasen ML and Skovgaard T: *Implementation of triple the time spent on physical education in pre-school to 6th grade: a qualitative study*. Currently undergoing review in *Evaluation and programme planning*

† : information is also described in the CHAMPS-study DK protocol article: Wedderkopp, N., Jespersen, E., Franz, C., Klakk, H., Heidemann, M., Christiansen, C., Moller, N.C., & Leboeuf-Yde, C. 2012. *Study protocol. The Childhood Health, Activity, and Motor Performance School Study Denmark (The CHAMPS-study DK).*

3. What (materials)

The professional development course: The physical education teachers participated in a professional development course based on an Age-Related Training concept (ATC). ATC is developed by Team Denmark (the Danish Elite Sport Foundation) who had published a description of ATC that were handed out to participants (in some cases an electronic version) (Bach & Eiberg, 2010; Pryce, Willeberg, Falkentoft, & Meyhoff, 2005). The Age-Related Training concept stresses the importance of training children in a biologically relevant manner to accord with their physical and physiological maturity. Moreover, the course also had a focus on how to arrange outdoor physical education, which was deemed a practical necessity in coping with the extensive pressure on facilities when implementing triple the amount of PE.

Please also see section '2.1 Programme description' in the manuscript.

† : information is also described in our article: Nielsen JV, Klakk H, Bugge A, Andreasen ML and Skovgaard T: *Implementation of triple the time spent on physical education in pre-school to 6th grade: a qualitative study*. Currently undergoing review in *Evaluation and programme planning*

4. What (procedures)

The additional PE: Schools were to implement triple the amount of weekly PE (4,5 hours versus the former 1,5). Schools were free to organize the PE as they pleased, as long as the children in question had PE minimum three days a week. The added amount of PE was not to replace other lessons or scheduled activities but resulted in longer school-days.

Collaboration: Programme managers included teacher representatives in the development of the programme. The overall idea was to diminish a top-down approach and tailor the programme to the school context. Additionally, all schools assigned a programme promoter. Either PE teachers or school heads acted as promoter, in some cases, school heads and a PE teacher chose to act as programme promoter simultaneously. Programme promoters participated in collaboration meetings with the programme managers and the promoters from the other schools. These collaboration meetings helped the flow of information from schools to programme managers and vice versa.

The professional development course: PE teachers also had to participate in a professional development course to uphold the general quality of the additional PE lessons. The course was based on ATC and partially focused on how to arrange outdoor PE, as this was deemed a practical necessity in coping with the extensive pressure on facilities when implementing triple the amount of PE lessons. The course was ultimately to help teachers feel qualified and to provide input on how to handle the additional levels of PE. In relation, all schools arranged some of the PE courses as outdoor PE despite season or weather conditions. However shortly after the initiation of the programme a pilot-project was established to develop the course.

Research: School heads and teachers found the attachment of research motivating as they got documentation on whether the programme and their PE lessons were effective. Thus, although the research were not meant as part of the intervention, its connection to the Svendborgproject had influence and will be described in this appendix. The research-study commenced in 2008, including children from preschool (age 5) till grade 4 (age 10). Children who reported any sort of musculoskeletal problems via a parental automated text message questionnaire were monitored individually by health care personnel.

Please also see section '2.1 Programme description' and '3,1 Adoption' in the manuscript.

5. Who provided

The additional PE: PE teachers delivered the additional PE by themselves. At all schools, pedagogic personnel aided the PE teachers in some of the PE lessons.

Collaboration: Programme managers coordinated and inviting programme promoters from the six participating schools to the collaboration meetings.

The professional development course: The professional development course was developed through a collaboration between the municipality of Svendborg, University College Lillebaelt (the institution educating teachers) and Team Denmark (the Danish Elite Sport Foundation). The educators of the professional development courses were mainly educators from University College Lillebaelt.

Research: The research activities was led by a senior researcher, who was responsible for the employment and supervision of a number of researchers.

† : information is also described in the CHAMPS-study DK protocol article: Wedderkopp, N., Jespersen, E., Franz, C., Klakk, H., Heidemann, M., Christiansen, C., Moller, N.C., & Leboeuf-Yde, C. 2012. Study protocol. The Childhood Health, Activity, and Motor Performance School Study Denmark (The CHAMPS-study DK).

† : information is also described in our article: Nielsen JV, Klakk H, Bugge A, Andreasen ML and Skovgaard T: *Implementation of triple the time spent on physical education in pre-school to 6th grade: a qualitative study;* Currently undergoing review in *Evaluation and programme planning*

† : information is also described in the CHAMPS-study DK protocol article: Wedderkopp, N., Jespersen, E., Franz, C., Klakk, H., Heidemann, M., Christiansen, C., Moller, N.C., & Leboeuf-Yde, C. 2012. *Study protocol. The Childhood Health, Activity, and Motor Performance School Study Denmark (The CHAMPS-study DK).*

† : information is also described in our article: Nielsen JV, Klakk H, Bugge A, Andreasen ML and Skovgaard T: *Implementation of triple the time spent on physical education in pre-school to 6th grade: a qualitative study;* Currently undergoing review in *Evaluation and programme planning*

6. How

The additional PE: PE teachers were to plan the additional PE lessons themselves. Pedagogic personnel that aided the PE teachers in some of the PE lessons were also ment to participate in the professional development course.

Collaboration: Collaboration meetings between programme promoters and programme managers were face-to-face meeting. The meetings were coordinated by the programme managers and were organized every third month.

The professional development course: The pilot-project ran from late-2008 to mid-2009 and contained 40 hours (divided across four modules). PE teachers (mainly the ones chosen as programme promoters) and pedagogic personnel across all schools in the programme participated. Through the pilot-project possible theory and exercises were tried out and participants were given group assignments to reflection on how the programme could be implemented on their school. In mid-2009 the professional development course was completed and available for all PE teachers and pedagogic personnel that had not already participated in the pilot-project. The professional development course consisted of different practical themes like how to teach ATC outdoor or in relation to ball games. School heads were the ones deciding when the teachers could attend the course.

Research: One of the programme managers were also assigned to be the gatekeeper between researchers and the schools. This was done to ensure that the visits from the researchers would run smoothly and coordinate the information that the schools received.

† : information is also described in our article: Nielsen JV, Klakk H, Bugge A, Andreasen ML and Skovgaard T: *Implementation of triple the time spent on physical education in pre-school to 6th grade: a qualitative study*. Currently undergoing review in *Evaluation and programme planning*

7. Where

The additional PE: The additional PE were mainly delivered at the individual school. Due to pressures on the local facilities outdoor activities and excursions to nearby nature were planned (woods, lakes, seaside etc.). Some schools visited local sports clubs (eg. basket, gymnastics, kayak) once or twice a year.

Collaboration: Collaboration meetings were held at the workplace of the programme managers in Svendborg municipality.

The professional development course: The professional development course for PE teachers were held at either one of the local schools that were part of the programme or University College Lillebaelt (located in the municipality of Svendborg).

Research: Most of the measures were made on the schools. For a few of measurements (like DEXA) children were driven to Odense (about 50 km.)

8. When and how much

The additional PE: The additional PE were implemented in mid-2008 and all schools still have 4.5 hours of weekly PE (red. spring 2018)

Collaboration: The collaboration meetings were held every third month.

The professional development course: The professional development course consisted of four-modules divided over eight months. The courses were available from mid-2009. The course was held was placed after the teachers normal working hours.

Research: All children were surveyed in 2008 (baseline) with questionnaires, physical examinations and physical testing. Some tests were performed regularly, others only once or a few times. In the first three years of the study some procedures were repeated twice yearly. In addition, all children were followed once a week with a parental automated text message (SMS-Track) questionnaire.

For a general overview of the timeline of the programme see figure 1

† : information is also described in our article:

Nielsen JV, Klakk H, Bugge A, Andreasen ML and Skovgaard T: *Implementation of triple the time spent on physical education in pre-school to 6th grade: a qualitative study*. Currently undergoing review in *Evaluation and programme planning*

† : information is also described in the CHAMPS-study DK protocol article: Wedderkopp, N., Jespersen, E., Franz, C., Klakk, H., Heidemann, M., Christiansen, C., Moller, N.C., & Leboeuf-Yde, C. 2012. *Study protocol. The Childhood Health, Activity, and Motor Performance School Study Denmark (The CHAMPS-study DK)*.

9. Tailoring

The schools who chose to be part of the Svendborgproject were also asked to join a working group to adjusted initial ideas and suggestions on programme content into a plan best suited to the schools of the municipality. The content suggested was initially outlined by Team Denmark and the programme managers. Another aim of this process was to establish core programme elements that had to be implemented at all participating schools. However, the working group was not limited by the content but could develop additional aspects. Furthermore, programme managers acknowledged schools as autonomous partners and assisted them in adjusting the concept to their specific institutional context. Acknowledging autonomy encouraged the schools to find their particular way of implementing core programme elements and, in the process, tailoring them to their individual conditions.

Although schools were encouraged to adapt the programme to their specific school, the schools were also required to implement specified, obligatory components (three times more PE, PE teachers participating in the course and having a programme promoter) to be part of SP.

† : information is also described in our article: Nielsen JV, Klakk H, Bugge A, Andreasen ML and Skovgaard T: *Implementation of triple the time spent on physical education in pre-school to 6th grade: a qualitative study*. Currently undergoing review in *Evaluation and programme planning*

10.Modifications

The professional development course: In 2016 the professional development course change from having four modules across eight moths to having 6 modules across eight months. Also, the courses was placed during teachers worktime and preparation time.

For additional adaptations made please see section '3.3.5 Programme adaptation' in the manuscript.

† : information is also described in our article:

Nielsen JV, Klakk H, Bugge A, Andreasen ML and Skovgaard T: *Implementation of triple the time spent on physical education in pre-school to 6th grade: a qualitative study.* Currently undergoing review in *Evaluation and programme planning*

11.How well (planned)

Please see section '3.3 Implementation' as well as table 3 in the manuscript.

12. How well (actual)

Please see section '3.4 Maintenance' as well as table 4 in the manuscript.

Appendix B

This is an example of the interview-guide used in one of the group-interviews with programme managers in the Svendborgproject. The full interview-guide as well as interview-guides for school heads, will be sent on request by contacting the first author.

Introduction to the interview

Introduction:

In general, we conduct the interview because we are interested in learning more about the history of the Svendborgproject. We are aware that the Svendborgproject was born and raised in the municipality and it is especially the municipal and your perspective as managers that we would like to have a better insight into. The interview will initially and mainly address the planning and structuring of the Svendborg project. Below we will also ask what consideration was given to how the plan should be implemented and the actual implementation of the project. In the end, we will talk about the process after the project was started and how it has developed and been maintained over time.

We hope that at a later date in the process you will want to talk to us if we find interesting topics that we will follow up or if we do not reach all our questions today.

The purpose of the Svendborgproject (Why)

What led to the initiation of the Svendborgproject?

- *Did you observe a need for the project?*
- *How did the idea originate?*
- *What enabled the project?*

Who were you aiming the SvenborgProject at?

- *Who were to benefit of it?*
- *Should the students achieve something?*
- *Specific student groups or grades?*
- *Should the parents achieve anything?*
- *Specific parent groups or classes?*
- *Should the schools achieve anything?*
- *Specific groups; managers or teachers*

Establishing the Svendborgproject (REACH)

How were you planning on achieving the purpose of the Svendborgproject?

- *On what background did you expect the elements to meet the purpose?*
- *Were there any elements that you considered as more important than others in terms of accomplishing the purpose of the Svendborgproject?*

How were schools and teachers recruited?

- *Were all schools informed and invited to attend?*
- *How were the schools informed about the project (mail, meeting, telephone)?*
- *What information did the schools receive before choosing to participate?*

How many schools did you ultimately want to recruit?

- *Did you experience any restrictions regarding the recruitment of schools?*
- *What considerations did you have regarding the schools involvement and capacity?*

How many teachers did you ultimately want to recruit?

- *Did you experience limitations in relation to the recruitment of teachers?*
- *What considerations did you have regarding the teachers' involvement?*

Initiation of the Svendborgproject (Adoption)

How did you plan to initiate the Svendborgproject?

- *What role did the school leaders play?*
- *Did you experience that the school leaders were equipped for the task?*
- *What role did the teachers have?*
- *Did you find that the teachers were equipped for the task?*

Who did you think had the main responsibility for the initial implementation?

- *What was your role in the initial implementation process?*
- *Did you take special initiatives to ensure implementation?*
- *What role did the school promoters have?*
- *Has the responsibility mainly been with the municipality, the school management, school promoters or the teachers?*

How did you experience the school's response to the Svendborgproject?

- *How did you feel that interested schools responded?*
- *How did you experience that non-interested schools responded?*
- *How did school response affect the implementation process?*

How did you plan to follow the implementation process?

- *How did you follow up on the individual school process?*
- *What methods did you use (meetings, oral feedback, reports, questionnaires, white papers etc.)*
- *What was the idea behind the schools developing a individual strategy report on how they operated the Svendborgproject (for documentation of implementation?)?*
- *Did you expect the programme to be adjusted during or after implementation?*

Implementation of the Svendborgproject (Implementation fidelity)

Did you set goals for when implementation could be accepted?

- *Did you set a quality-score or a set of minimum requirements for the implementation?*
- *Did you set a criterion regarding teachers' participation in the professional development course?*
- *Did you set a criterion regarding the percentage of physical education lessons the students were receiving?*
- *Did you set a criterion regarding the use of the age-related training concept?*
- *Did you set a criterion regarding the level of intensity during physical education lessons?*
- *Did you set any other criterions?*

The adjustment of the Svendborgproject (Adaption)

To what extent has the project changed since it was initiated in 2008?

- *Has there been a change in the definition of the Svendborgproject?*
    - *Why?*
- *Have there been any changes in the vision the Svendborgproject?*
    - *Why*
- *Have changes occurred in the requirements of being part of the Svendborgproject?*
    - *Why?*
- *What was the basis for the revision of the concept as of 2012?*

What has contributed to adaption of the Svendborgproject?

- *What circumstances have made these changes possible?*
- *What restrictions have caused changes in the programme?*
- *What role has the research played?*
- *What role have the schools played?*
- *What role has politicians played?*

Maintenance of the Svendborgproject (Maintenance)

What did you think was the most important thing about the project?

- *What is a story you tell others about the project?*

Have there been any particular challenges or resistance along the way?

- *Can you give an example of this?*
- *How did these challenges affect the programme?*
- *How have the challenges affected your work with the programme?*

Are you aware of any threats that could affect the survival of the Svendborgproject?

- *Can you give an example of these threats?*
- *How are you dealing with these threats?*

Appendix C

This is an example of the questionnaire used at the physical educational teachers in the Svendborgproject.

The full questionnaire will be sent on request by contacting the first author.

Welcome to a questionnaire about the implementation of the Svendborgproject.

Initially we ask on factors influencing your school as part of the Svendborgproject and being a physical education teacher at a sports school having 4.5 hours of physical education every week from pre-school to sixth grade

We hope you can find the time to answer out the questionnaire. In this way, you help us become more aware of how you work with the Svendborgproject in your physical education lessons at your school.

The questionnaire takes approx. 12 minutes to complete.

If you want to correct your previous answers along the way, navigate back and forth in the questionnaire by clicking "Previous" and "Next" at the bottom of the screen (not on the arrow keys in Explorer or similar browser).

Unfortunately, it is NOT possible to close the questionnaire without having to start over again.

To end the answer, touch "Finish" on the last page.

Thanks for your time

General information

In the following we ask for general information about your profession and position

1) Do you take part of the physical education at your school?

(1) ❑ Yes

(2) ❑ No

(3) ❑ Do not know

2) Have you ever taken part of physical education lessons at your school in the period

2008-2015?

(1) ❑ Yes

(2) ❑ No

(3) ❑ Do not know

3) At what school are you currently employed?

(1) ❑ Issø-skolen (Kirkeby)

(2) ❑ Issø-skolen (Stenstrup)

(3) ❑ Nymarkskolen

(4) ❑ Rantzausminde

(5) ❑ Skårupskole

(6) ❑ Stokkebækskolen (Gudme)

(7) ❑ Stokkebækskolen (Gudbjerg)

(8) ❑ Stokkebækskolen (Hesselager)

(9) ❑ Thurøskolen

(10) ❑ Tvedskole

(11) ❑ Tåsingeskolen (Lundby)

(12) ❑ Tåsingeskolen (Sundhøj)

(13) ❑ Vestermarkskolen

(14) ❑ Vestre skole

(15) ❑ Ørkildskolen (byen)

(16) ❑ Ørkildskolen (øst)

(17) ❑ do not know

4) What school year did you get employed at your current school?

(1) ❑ Before 2008/2009

(2) ❑ 2008/2009

(3) ❑ 2009/2010

(4) ❑ 2010/2011

(5) ❑ 2011/2012

(6) ❑ 2012/2013

(7) ❑ 2013/2014

(8) ❑ 2014/2015

(9) ❑ 2015/2016

(10) ❑ Do not know

Being part of the Svendborgproject

In the following we ask about you being on a school that is part of the Svendborgproject

21) To what extend do you agree on the following statements

	agree	partially agree	partially disagree	disagree	Do not know
I am informed of my duties as a physical education teacher	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
I am professionally dressed to take care of the physical education lessons	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
I know what is expected of me as a physical education teacher	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
My work as a PE teacher is often threatened by other tasks	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
I commit to the school being part of the Svendborgproject	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑

22) Here you are welcome to elaborate or explain your answers of the questions above

_____

_____

_____

_____

_____

_____

23) Try to remember back in 2011, just before the merging of the schools in Svendborg Municipality – to what extend do you agree on the following statements

	agree	partially agree	partially disagree	disagree	Do not know
Pre-school to sixth grade had 4.5 hours of weekly physical education lessons	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
Pre-school to sixth grade had physical education at least 3 days a week	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
I had a focus on planning physical education lessons outdoor	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
I felt a good collaboration with the school management regarding the school being part of the Svendborgproject	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑

24) Here you are welcome to elaborate or explain your answers of the questions above

_____

_____

_____

_____

_____

Physical education lessons

In the following we ask to the content of your physical education lesson

25) At what grade do you handle physical education? (you are allowed to choose more than one answer)

(1) ❑ Pre-school

(2) ❑ 1st grade

(3) ❑ 2nd grade

(4) ❑ 3rd grade

(5) ❑ 4th grade

(6) ❑ 5th grade

(7) ❑ 6th grade

(8) ❑ Do not know

26) Please consider the following statements

	Yes	No	Do not know
The students in the pre-school have at least 20 minutes of high intensity in your physical education lessons	(1) ❑	(2) ❑	(3) ❑
During a normal week, physical education lessons for pre-school students are spread over a minimum of 3 days	(1) ❑	(2) ❑	(3) ❑
During a normal week, students in pre-school have at least 4.5 hours of physical education	(1) ❑	(2) ❑	(3) ❑

27) Please consider the following statements

	Ja	Nej	Ved ikke
The students in the 1st grade have at least 20 minutes of high intensity in your physical education lessons	(1) ❑	(2) ❑	(3) ❑
During a normal week, physical education lessons for	(1) ❑	(2) ❑	(3) ❑

	Ja	Nej	Ved ikke
1st grade students are spread over a minimum of 3 days			
During a normal week, students in 1st grade have at least 4.5 hours of physical education	(1) ❑	(2) ❑	(3) ❑

28) Please consider the following statements

	Ja	Nej	Ved ikke
The students in the 2nd grade have at least 20 minutes of high intensity in your physical education lessons	(1) ❑	(2) ❑	(3) ❑
During a normal week, physical education lessons for 2nd grade students are spread over a minimum of 3 days	(1) ❑	(2) ❑	(3) ❑
During a normal week, students in 2nd grade have at least 4.5 hours of physical education	(1) ❑	(2) ❑	(3) ❑

29) Please consider the following statements

	Ja	Nej	Ved ikke
The students in the 3rd grade have at least 20 minutes of high intensity in your physical education lessons	(1) ❑	(2) ❑	(3) ❑
During a normal week, physical education lessons for 3rd grade students are spread over a minimum of 3 days	(1) ❑	(2) ❑	(3) ❑
During a normal week, students in 3rd grade have at least 4.5 hours of physical education	(1) ❑	(2) ❑	(3) ❑

30) Please consider the following statements

	Ja	Nej	Ved ikke
The students in the 4th grade have at least 20 minutes of high intensity in your physical education lessons	(1) ❑	(2) ❑	(3) ❑

	Ja	Nej	Ved ikke
During a normal week, physical education lessons for 4th grade students are spread over a minimum of 3 days	(1) ❑	(2) ❑	(3) ❑
During a normal week, students in 4th grade have at least 4.5 hours of physical education	(1) ❑	(2) ❑	(3) ❑

31) Please consider the following statements

	Ja	Nej	Ved ikke
The students in the 5th grade have at least 20 minutes of high intensity in your physical education lessons	(1) ❑	(2) ❑	(3) ❑
During a normal week, physical education lessons for 5th grade students are spread over a minimum of 3 days	(1) ❑	(2) ❑	(3) ❑
During a normal week, students in 5th grade have at least 4.5 hours of physical education	(1) ❑	(2) ❑	(3) ❑

32) Please consider the following statements

	Ja	Nej	Ved ikke
The students in the 6th grade have at least 20 minutes of high intensity in your physical education lessons	(1) ❑	(2) ❑	(3) ❑
During a normal week, physical education lessons for 6th grade students are spread over a minimum of 3 days	(1) ❑	(2) ❑	(3) ❑
During a normal week, students in 6th grade have at least 4.5 hours of physical education	(1) ❑	(2) ❑	(3) ❑

33) Here you are welcome to elaborate or explain your answers of the questions above

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The professional development course

In the following we ask for your use of the professional development course in your physical education lessons

34) Have you attended the professional development course?

(1) ❑ Yes

(2) ❑ No

(3) ❑ Do not know

35) What school year did you attend the professional development course?

(1) ❑ 2008/2009

(2) ❑ 2009/2010

(3) ❑ 2010/2011

(4) ❑ 2011/2012

(5) ❑ 2012/2013

(6) ❑ 2013/2014

(7) ❑ 2014/2015

(8) ❑ 2015/2016

(9) ❑ Do not know

36) To what extend do you agree on the following statements

	agree	partially agree	partially disagree	disagree	Do not know
I was looking forward to attending the professional development course	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
The professional development course was useful in relation to the planning of my physical education lessons	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
The professional development course ensured that I could handle the extra amount of physical education lessons	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
The professional development course was difficult to transfer to my physical education lessons	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑

37) Here you are welcome to elaborate or explain your answers of the questions above

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37) To what extend do you agree on the following statements

	agree	partially agree	partially disagree	disagree	Do not know
I plan a minimum of 3 hours of my physical education lessons following the principles of Age-related Training	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
It is difficult for me to apply the elements from Age-related Training in my physical education lessons	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑

40) To what extend do you agree on the following statements

	agree	partially agree	partially disagree	disagree	Do not know
I plan a minimum of 3 hours of my physical education lessons following the principles of Age-related Training	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑

	agree	partially agree	partially disagree	disagree	Do not know
It is difficult for me to apply the elements from Age-related Training in my physical education lessons	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
I am professionally qualified to apply Age-related Training in my physical education lessons	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
Applying Age-related Training has become an integral part of my physical education lessons	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑
The use of Age-related Training in physical education lessons is often threatened by other tasks	(1) ❑	(2) ❑	(3) ❑	(4) ❑	(5) ❑

41) Here you are welcome to elaborate or explain your answers of the questions above

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Appendix D

This appendix contains examples of selected citations from the qualitative material. Citations are presented across the adoption, implementation and maintenance dimension of the RE-AIM framework, as these were the dimensions the qualitative data were informing on (see table 2). All citations have been identified through the coding process (see section "Qualitative data analysis").

RE-AIM dimension	Programme manager interviews	School head interviews	Document analysis
			Note: Collaboration minutes were also part of the document data and were part of the coding process (see section "Qualitative data analysis") in the manuscript. However, due to collaboration minutes being short phrased or in note form, no citations were drawn.
Adoption: The commitment of participating schools regarding their decision to install the programme and factors influencing that decision.	It [satisfied physical education teachers] was like a natural part of the programme, I think … and they got the professional development course … not that the teachers became happier, but their education [Physical education] became accepted as a big part of the school day… [Programme manager 1]	Then came the entire research programme, which was also exciting for the teachers. They were eager for their students to be measured again…. To see whether they could track any progress and so on … it felt like a different… a special school day, so … I think it was a boost, there was real excitement… [School head 2]	The school wishes not only to define itself as a school with additional physical education, but as a many-sided school, where our physical activity focus is to be strengthened through the Svendborgproject. We wish to develop a culture of physical activity environments focusing on learning, well-being, movement and healthy living. [School strategy report]
	And it [the professional development course] is also a quality boost for the physical education teachers, and hopefully they think it is more fun to arrange physical education… but also… what they repeatedly tell us is that it has been invaluable in that they really feel that they are highly equipped to handle it [the extra amount of physical education]! [Programme manager 2]	Do you feel that you as a school have achieved a co-ownership of the Svendborg project? I certainly think so. I surely think that if we had not become a part of the programme and declined, I think it had resulted in us regretting it … That we would have felt like damn, why did we not participate … No, really, it is a great satisfaction to be part of the programme. [School head 2]	It is encouraging that we as part of the programme are able to be more thorough with the individual sports and we also have the opportunity to cover more and different sports [School strategy report]

The school has always had a strong physical activity profile. We have committed physical education teachers and good facilities for sports activities. We have made a clear |

…and there was not much enthusiasm in the beginning… eventually it came… but it was a required condition that we had those more or less frustrating talks about what this programme implied and what it should contain… because we did not define the programme in advance… we were supposed to develop it together [with the teachers]… You have to be patient in that process… because you are developing a mutual basis and a shared language to speak from… [Programme manager 3]

I also believe… the high degree of information and the dialogue [between schools and programme managers] that we had in '08 … it really meant a lot, also regarding the information from the researchers and the dialogue with the schools and you [one of the other informants that acted as main programme managers in 08] … [Programme manager 3]

… and the news value! We may never get the same [news value] ever again, but you might get the same high engagement … And still, no one had real ownership of the programme because it was new to everyone [schools, teachers and programme mangers] … So, maybe it was just luck, you might say that it was just the right moment in time?

I think that the uniqueness in this was the involvement of physical education teachers in the beginning … I think it's like a textbook example of how you need to involve the parties involved in everyday life when doing something that promotes children's learning and well-being … And they did [the programme mangers] … [School head 3]

strategy regarding our physical education i.e. a guide to teachers, students and parents, so everyone knows the common guidelines regarding physical education at our School. [School strategy report]

It was almost a legendary workgroup [teacher representatives, school heads and programme mangers developing the programme], and I think when everyone who has been in that workgroup meets today, they are like "Remember when we did that…?" , "Do you remember…?" … I even dare to say that there was a euphoria in the development phase "could this programme really become something?" … [School head 4]

… Sometimes I think "Well, why did it happen?" Well, it did because they included all of them [teachers and school heads] and invited them [teachers and school heads] to work with it. [School head 4]

	[Programme manager 1]	
Implementation: The extent to which the schools implemented the various elements of the programme as intended and how the programme has been adapted over time	… and I think that was one of the strengths in the beginning, we had that very close contact and dialogue [with the schools] … and just talked to them … I think it's just a lot more important than you might even realise while you're doing it [developing and planning the programme], but when we look back that process, I think it's important, it's a huge strength … it does not necessarily have to be meetings, but you need to have that close dialogue and follow-up… [Programme manager 3]	
We were to evaluate the concept… and we actually got feedback from some of the promoters at the schools suggesting that the programme might have gotten a little diluted over time… because in that first concept they [the requirements] were described rather vaguely … So, they actually asked us to be more detailed as regards the requirements of being part of the programme… and in this process of evaluating what had been good and bad… we also adopted the research results… and in the process of the evaluation we found the new concept… [Programme manager 3]	Well we realized [after the first year] that it could be implemented… It can be realized in relation to the timetables, it can be delivered by the teachers and it can hold from an economical perspective… From the beginning, we have decided that this will not cost an extra penny in any props… So, there are no extra props and no extra balls or any of such things… So, we had to think outside the box, how can we get more movement, how can we do this… [School head 3]	Three years have passed since the start of the programme, and we should therefore look at how it has met with the requirements in relation to the concept. 1) Do schools comply with the requirement that physical education is organized so that the 4.5 hours are distributed in minimum 3 days? 2) Is the physical education adequately adapted to the age-related training concept? 3) Is there a need for brush-up course for the teachers and pedagogues?
	In all-seasons we had two hours fixed as outdoor physical education… That resulted in, among other things, that you played hockey on the pitch outside	The questions are discussed as schools report back. All schools have divided the hours for at least 3 days a week. School 3 reports that the new teachers and pedagogues should attend ATC. The other teachers and

Interviewer: Okay, and those revisions you made to the concept, what were the reason? Programme manager 3: Research results among others... Programme manager 2: But also that the schools actually demanded that the concept was a little more clear and direct... so they had less... more frame and less freedom... Programme mangers 3: We had a very very soft description in the first concept, among other things, we had written that ATC should only be considered, but there was a request from the schools that ATC should be obligatory to use and that's why we actually succeeded to require that four hours of the physical education lessons must be based on ATC	with a red puck and not a white puck because it would get lost in the snow... And we also got some small improvements on outdoor areas... the whole outdoor facility area has been something where improvements have been made... mainly because of the need for more space... [School head 4]	pedagogues use it. School 6 reports that it is important everyone attends the professional development course. Brush-up courses for every one else could be fine. Important with skilled teachers. [Collaboration minute] In relation to the 2010 budget agreement, funds were allocated to the schools for a continuation of the Svendborgproject. The funds deposited cover a continuation of the fully-developed project, including triple the amount of physical education for all grades from pre-school to sixth on the six schools. [Collaboration minute] Teachers have gained new knowledge and been energized. It [the professional development course] have forced teachers to reflect on the content of their physical education lessons in a new way ... The physical education lessons have changed significantly - the teachers have brought a lot of new knowledge to school... [Internal evaluation] The spring and summer semesters were arranged so that the children had "outside days" where Physical education was planned in relation to the nature-technology lessons. With the low grades we went on excursion to the forest or

Maintenance		
Maintenance: The extent to which the schools maintained programme implementation and whether the programme has become an integrated part of their daily practice	These days we are writing the budget for the coming year... And some new programmes, like more physical activity for children from zero to six years, but also our talent development programme... it is being stressed that the programmes are related to the Svendborgproject... So, the Svendborgproject has actually become something that can help start other programmes... give some goodwill at political level when the new programme is related to it [the Svendborgproject]... [Programme manager 2] Of course, there has been some opposition along the way, from some of the director areas and so on... but when	When the programme has existed for six, seven, eight years, it becomes part of everyday life... I do not believe that anyone thinks about it anymore... thinking "We are in the Svendborgproject"... It is incorporated into the school's way of doing school and planning... There is no question about that... [School head 3] The way we execute the concept on our school is the same as what we started... It has not changed although, the last couple of years, we have discussed whether we should look at how we do it, if we are still think it is the way to do it... if we should	It is informed that the current meeting structure has been evaluated. This has resulted in all existing networks stopping [including the collaboration network in the Svendborgproject] and new ones will occur based on the "rosin bread" model - Ie local networks are established as needed. If existing networks are to resurface, they should be facilitated through bottom-up initiative. It is important that the new networks still have management support, the agenda and the minutes. Teacher from school 3: The collaboration network in the Svendborgproject has its own unique history. It provides a good update of

Blue column:

beach and with the higher grades we biked in the local area. [School strategy report]

It's a huge puzzle to plan the additional physical education lessons. The school have mainly used the morning modules (8 am to 10 am) or from 10 am to 12 am as it has to be matched to the pedagogues working hours. All grades part of the in the programme have physical education four days a week. At least two physical education lessons is placed outdoor all year regardless of the weather. [School strategy report]

the school reform came [New Danish reform introduced in 2014 that among other things required schools to implement 45 minutes of daily physical activity] it was actually not even up for discussion that we should maintain the Svendborgproject. Everyone just wanted to continue... It is still voluntary whether the schools want to be part of the programme... everyone just are... and they do not only have those 45 minutes of movement, they have the six lessons or 4.5 hours of physical education a week... We're often asked how we did this but it's just a choice we have made that this is how we do it...
[Programme manager 3]

continue or change our way of executing the concept... But every year we just confirming that this is the way we want to do it...
[School head 3]

The programme is an integrated part of the school day in Svendborg, so it is not something which we are still developing or question... I cannot say if they discuss at other schools, I do not know... but it has not been mentioned at the collaboration meetings, that something that was problematic, or you should rethink the programme again... the programme is an integrated part...
There might be some challenges in terms of getting teachers to attend the professional development course because of new physical education teachers being hired all the time... but I that there were some follow-up courses for new teachers last year...
[School head 4]

knowledge and discussion of issues at the participating schools. The coming school year will continue to bring challenges and it is agreed that the collaboration network will continue the next year. A coordinating group will be set up, which is responsible for scheduling themes and timeframes for the meetings in the next school year.
[Collaboration minute]

The last part of the professional development course is in June. There will be follow-up courses for new teachers and pedagogues - remember registration. Good feedback has been given on current courses. It is important in terms of the coming courses to get feedback to optimize and customize the courses. There is still a wish that future courses will be offered in the future, and with even more focus on outdoor activities.
[School strategy report]

How is the process at the schools? Is there any need for further professional development? Are there any schools that have some special challenges?
Question: "20 minutes of high intensity" can be difficult to define and it is also hard to asses if the students have high intensity.

Answer: There should be no doubt and perhaps the term should be redefined or described better in the concepts.
Question: At some schools, there are challenges and doubts as to whether they live up to the four hours of ATC based physical education. Answer: Programme manager 2 addresses this and what they can do to resolve this. New structures may help make it easier to implement ATC. For instance, school 3 has implemented the ATC terms into the lesson descriptions - hereby everyone knows what is the focus on those lessons. Programme managers would gladly visit the school and help out with the process at the individual school.

Paper III

Nielsen J.V., Bredahl T.V.G., Bugge A., Klakk H., Skovgaard T. *Implementation of a 10-year intervention that tripled the time spent in physical education: exploring provider and programme characteristics*. Evaluation and program planning. In review.

Implementation of a 10-year intervention that tripled the time spent in physical education: exploring provider and programme characteristics

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Abstract

There is an ongoing need for research focusing on how to implement physical activity programmes into a school setting. This includes documentation of the extent to which programmes are compatible with the basic views of providers and their local practices as these directly affect programme implementation and maintenance. The aim of this study was to explore provider and programme characteristics of the Svendborgproject – a programme tripling the amount of physical education, sustained for 10-years and documenting decreased incidence of overweight, obesity and cardiovascular risk factors. Six school heads and six teachers were interviewed to explore how they perceived programme compatibility to their school's practice and their own role as providers during the adoption, implementation and maintenance process. Both teachers and school heads found the additional lessons a valuable asset that fitted existing school values and priorities. Additionally, physical education teachers participated in a course providing new perspectives and teaching methods that aided the implementation of the programme. Lastly, school heads stressed that implementation fidelity was heavily dependent on the dedication of physical education teachers and on having simple programme requirements that made it clear what could be expected of the programme.

Keywords: *Health Promotion; School health; Implementation; Qualitative research approaches; CHAMPS-study DK*

1. Introduction

School-based physical activity (PA) programmes have the potential to improve children's physical and mental health, as well as their academic achievements (Bangsbo, Krustrup, Duda, Hillman, et al., 2016; Dobbins, Husson, DeCorby, & LaRocca, 2013; Langford, Bonell, Jones, Pouliou, et al., 2014; Waters, de Silva-Sanigorski, Hall, Brown, et al., 2011). However, the success of school-based PA programmes is heavily dependent on effective implementation. Thus, there is an ongoing need for research focusing on how to implement and disseminate promising programmes in everyday school practice (Durlak & DuPre, 2008; Naylor, Nettlefold, Race, Hoy, et al., 2015; Wandersman, Duffy, Flaspohler, Noonan, et al., 2008).

Studies have showed that providers of school-based programmes (school heads and teachers) consider the school as an optimal setting for PA initiatives (Clarke, Fletcher, Lancashire, Pallan, et al., 2013; Griffin, Clarke, Lancashire, Pallan, et al., 2015). However, providers are also aware of the many barriers to implementing such programmes (e.g. lack of time, of resources, of parent support and of management coordination) (Clarke, et al., 2013; Griffin, et al., 2015). Teachers in particular can find the implementation of new PA programmes demanding, as they often challenge their professional identity and add to their work load (Ballet & Kelchtermans, 2009; Griffin, et al., 2015). This often leads teachers to perceive new programmes as being threatening to the maintenance of academic standards and to their relation to pupils (Ballet & Kelchtermans, 2009; Clarke, et al., 2013; Griffin, et al., 2015). School heads can be viewed as gatekeepers, deciding whether programmes should be introduced at their school, and their commitment and motivation has been highlighted as important for the successful implementation of school-based programmes (Forman, Olin, Hoagwood, Crowe, et

al., 2008; Langille & Rodgers, 2010; van Nassau, Singh, Broekhuizen, van Mechelen, et al., 2016).

In their ecological framework, Durlak and Dupre describe five domains that affect the implementation process: the providers, the programme, the community, the support system and the organization (Durlak & DuPre, 2008). Both the provider and programme domain have also been mentioned by others as important aspects in the investigation of the implementation and dissemination of programmes (Greenhalgh, Robert, Macfarlane, Bate, et al., 2004; Maria Ingemarson, Bodin, Rubenson, & Guldbrandsson, 2016; Rogers, 2003; Wandersman, et al., 2008). It has even been proposed that the providers *'are the programme'* (Fixsen, Blase, Naoom, & Wallace, 2009), and that the characteristics both of the providers adopting the practice and of the programme itself are associated to barriers and incentives affecting programme implementation and maintenance (Durlak & DuPre, 2008; Greenhalgh, et al., 2004; Maria Ingemarson, Bodin, Rubenson, & Guldbrandsson, 2016; Ogden & Fixsen, 2014; Rogers, 2003; Wandersman, et al., 2008). Analysing programme's compatibility with the basic views, practices and local context of providers is, then, an important element in the evaluation of school-based programmes. The ecological framework addresses the provider domain as the characteristics of providers of a given programme in relation to their perceived need for and benefit of that programme. Additionally, emphasis is placed on the providers perceived ability to deliver the programme in a given context and on their skill proficiency. Programme characteristics relate to the programmes fit to the existing practice and priorities of a specified setting, whereas adaptability concerns a programme's ability to be modified to fit local needs. Programme and provider characteristics are described further in Table 1.

By analysing programme and provider characteristics of a well-established and enduring school-based PA programme, it is possible to gain valuable insights into motives for

programme adoption, implementation success, and maintenance. Therefore, the aim of the study is to analyse provider and programme characteristics of the Svendborgproject (SP) - a programme tripling the amount of physical education (PE), sustained for 10-years and documenting decreased incidence of overweight, obesity and cardiovascular risk factors.

2. Method

2.1 The Svendborgproject (SP)

SP has been successfully implemented and sustained by the Danish municipality of Svendborg over a period of ten years (2008-2018). The incentive for establishing SP came from the municipal authority's decision to promote additional PE in its primary schools. In Denmark, public schools are funded from taxes and organized by the local authorities in the municipality. Politicians in Svendborg municipality decided to allocate funds to co-finance the expenses of running the programme for all enrolled schools for three years.

Six schools initially chose to become part of SP and helped co-develop the programme before initiation. Of the six schools that initiated the programme in 2008, four were located in rural areas and two in urban-suburban areas. The programme focused on improving the quality of PE and tripling the number of weekly PE lessons in state schools in the municipality (offering 4.5 hours per week instead of the mandatory 1.5 hour per week). To support the aims of SP, the teachers involved attended a professional development course based on an Age-related Training Concept (ATC), which focused on children's physical, physiological, mental, and social development in order to enhance and optimize motor skills (Bach & Eiberg, 2010; Pryce, Willeberg, Falkentoft, & Meyhoff, 2005). More information on the professional development course can be found in Appendix A. Furthermore, each school

appointed a programme promoter to act as a local ambassador and participate in collaboration meetings every quarter.

When the programme was initially established, researchers were allowed to follow the development, leading to a substantial programme of research: The Childhood Health, Activity, and Motor Performance School Study Denmark (CHAMPS-study DK) (Wedderkopp, Jespersen, Franz, Klakk, et al., 2012). This programme of research demonstrated that SP was effective in increasing physical activity and decreasing sedentary behaviour during school time, as well as decreasing the incidence of overweight, obesity and cardiovascular risk factors (Klakk, Andersen, Heidemann, Moller, et al., 2014; Klakk, Chinapaw, Heidemann, Andersen, et al., 2013; Moller, Tarp, Kamelarczyk, Brond, et al., 2014).

Besides the programmes ability to prove effective in promoting child and adolescent health and show long-term sustainability over a period of nearly ten years, the Svendborgproject also expanded to all schools in the municipality of Svendborg in 2012. This was a choice-based expansion, meaning that every school again were asked and actively had to decide if they wanted to become part of the programme. A previous process evaluations study of SP have established in depth information about programme features and that the programme has been implemented and maintained with high fidelity (Nielsen, Skovgaard, Bredahl, Bugge, et al., 2018). Furthermore, programme managers perspective on influential implementation factors has also been published (Nielsen, Klakk, Bugge, Andreasen, et al., 2018). However, in depth provider perspective is still needed in order to support the implementation of future school-based PA interventions. The present study is part of the CHAMPS-Study DK and uses Durlak and DuPres description of provider and programme characteristics (Durlak & DuPre, 2008) (Table 1) to investigate how PE teachers and school heads perceive the characteristics of SP and themselves as providers.

2.2 Interviews

School heads and PE teachers are viewed as the main providers of SP. Three group interviews with six teachers (two teachers in each interview) and six single interviews with school heads were conducted. Interview participants were chosen through purposeful sampling (Kelly, 2010), which ensured key informants with sufficient knowledge of SP and programme activities across all the six participating schools. Interview questions were framed in an open-ended manner within the context of the programme. Examples of the questions used to inform the provider and programme characteristics can be found in Appendix B. All respondents received a letter of information before the interviews, explaining the purpose of the interview, and they all signed written informed consent. All interviews were audio-recorded and performed in private rooms at the workplace of the interviewees. The programme of research was approved by the Danish Research Ethics Committee (Project-ID: S-20080047 and S-20140105).

2.3 School heads

A list of former and current school heads, deputy heads and heads of departments across the six schools was created in collaboration with the municipal programme managers. School heads most likely to yield relevant and useful information due to their current or former engagement in the programme were highlighted and invited to participate in the study. In some cases, deputy heads were chosen to take part, if they were assessed to have better insight into the programme and the implementation process. Seven heads were invited to participate in a 45-minute semi-structured interview and six agreed. The one school head who declined argued that it was due to lack of time.

2.4 Teachers

A list of teachers who had acted as programme promoters across the six schools was created in order to identify potential respondents. Programme promoters were chosen for interview due to their in-depth understanding of the programme and broad insight of the implementation process at their individual school. To identify additional respondents relevant for interviewing, school heads were asked to identify PE teachers who had detailed knowledge of the programme. Finally, six PE teachers (one was a pedagogue who also taught PE and had attended the ATC course) across three of the participating schools were interviewed. Four of the respondents were former or current programme promoters. The last two respondents had been put forward by the school head as possessing detailed knowledge of the programme. The teachers were interviewed in pairs, resulting in three 60-minute semi-structured group-interviews being conducted. Semi-structured group interviews were chosen in order to gather the teachers' collective memory and constructions across the 10 year implementation process.

2.5 Analysis strategy

School head and teacher interviews were analysed using qualitative content analysis (Schreier, 2014). Initially, the interviews were transcribed verbatim and names were anonymized. Subsequently, the first author thoroughly familiarized himself with the data prior to coding the material. This familiarization was done by repeated listening and reading of the material while taking notes. Subsequently, the first author trial-coded a large portion the interviews according to a coding-frame comprised of the programme and provider characteristics (Table 1). The trial-coding was used to adjust and refine the coding frame. Subsequently, all data that had been used in the trial-coding were re-coded with the adjusted coding-frame together with the rest of the interview data. In the final step of the analysis the first author thoroughly read the coded

material and selected main quotations relating to the provider and programme characteristics in order to prepare the findings for presentation. Examples of quotations across the provider and programme characteristics can be found in Appendix C.

3. Results

3.1 Perceived need for the programme

When the programme was introduced, the municipality of Svendborg had just been merged with two of the smaller surrounding municipalities. School heads emphasise that they perceived the programme as something that had the potential to promote a community spirit in the school area and between teachers from the various schools in this new municipal constellation. In addition, both school heads and teachers point out that the programme was important since there is a need for activities that can promote healthy children and counteract the rising 'inactivity epidemic'. Teachers and heads across all schools also stress that the programme fitted their individual and overall school values regarding the prioritizing of PE and PA, as they perceived movement as an educational tool that could be used to aid social cohesion and self-confidence in their pupils. A school head describes:

> *Well, I believe that a child's first communication is through their body... so, it is very important that they know how interact with each other physically... if you are not able to kick a ball or are in the way all the time, then you are put on the bench and get marginalized even from an early age... I think it means the world that they learn how to use their bodies, and enjoy using*

them in play with others... the social development of children is

increased, I am sure of it... [School 3 – head]

3.2 Perceived benefits of the programme

Both teachers and heads refer to the research results, reporting that the pupils have become healthier, as an important benefit of the programme. However, they also report perceived benefits in increased self-confidence, self-belief and general motor skills in the pupils. Teachers' interviews show that even though the focus on health outcomes is relevant and important, their main purpose is to educate.

In PE lessons there is some social education build into it...

because, when you are playing a game or doing exercises, the

pupils need to learn to be quiet when new instructions are given

and so on... but especially in relation to the social aspect...

when playing the game, they have to respect the rules of the

game but also respect each other, otherwise the game will

collapse... and now we have gotten the opportunity to focus even

more on this because we have more PE lessons... [School 3 –

Teacher]

Teachers emphasise that the additional PE has also resulted in more time being available for the introduction of a variety of sports, ensuring that all pupils have the opportunity to master the needed skills. Teachers perceive that this has aided the pupils in becoming masters of their own body. In relation, teachers and heads conclude that the programme has been

especially beneficial for pupils who feel insecure in relation to movement and sports. A teacher express:

> *I think those who benefit from this [the school being part of the programme] are the children who feel very insecure regarding movement, touching a ball or using the facilities in the gym... and by having to do it several times a week, they become so much more skilled, they are actually making progress from being at a very low skill level and are clearly getting better and more confident... I do not think that the children who are already good at sports are becoming significantly better... but those who are insecure benefit greatly from the school being part of the Svendborgproject [School 6 – Teacher]*

3.3 Perceived ability to do what is expected

The collaboration between municipal programme managers and schools has been an important factor aiding the implementation of SP. The quarterly collaboration meetings between programme managers and schools were perceived as a constant reminder of the school being part of the programme and of what was expected of them. School heads report that this resulted in healthy reflection on the reason why they chose to retain the programme. Furthermore, the collaboration meetings aided school heads in their decision-making through the sharing of experiences, knowledge and ideas in an open forum. To implement the programme, schools had to abide by a fairly simple set of requirements that were non-negotiable and established a framework in which schools could develop their own implementation strategies. School heads

see this framework as an important tool for finding their way and act accordingly. A school head elaborates:

> *There is a need for external decision-making... decisions from someone not part of the individual school culture... Because it really has been an important aspect in this programme... if we were told to develop this kind of concept and we had to figure it out ourselves... then we would never have got this far... this programme is just unique because there is a framework, there is some external control that ensures that we, as a school, are able to say that this is how it is. Now how do we act on it [School 1 – head]*

Both teachers and school heads stress that backing from politicians, programme managers and the school board was important for their ability to implement the programme. In particular, the political decision to financially support the programme and the choice of the programme as part of the political strategy of the municipality have helped management to argue for the relevance of prioritizing the programme.

> *The thing that helps me as a school head is the strong political dedication to the programme... When politicians in Svendborg municipality prioritized this, and said that they wanted to promote it in all schools in the whole municipality, that they would give a big sum of money to support the schools... they*

were talking a lot about the programme, they organised conferences and similar events... it helps make the programme happen as it also sweeps away resistance [School 6 – head]

School heads have been central actors in securing that core programme requirements were implemented at their schools. However, school heads stress that the general backing of school staff has significantly aided their ability to make the changes needed to fulfil programme requirements. The commitment of PE teachers and local school programme promoters are especially important as a driver to ensure progression and maintenance. Yet, teachers emphasise that school heads and teachers are interdependent, as school management has to make the decisions as programme promoters do not feel comfortable nor that they have the authority to lead their peers.

You need some PE teachers who find value in the programme... who are dedicated and can see its potential ... If I were to listen to physical education teachers each day saying 'it is awful that we have these six hours of PE - The kids are tired and we cannot make it work'... Well, that would be something else, but the PE teachers love it! The vast majority of the children are fond of PE ... But the teachers' involvement is the most important... [School 4 – head]

3.4 Perceived skill proficiency

In order to implement the programme, PE teachers were to participate in a professional development course that would assist them with new skills to plan the additional PE. In general teachers were excited to participate in the course, as it presented new ideas, perspectives and inspiration for practical exercises that could be used in their PE lessons. Even teachers reporting that they felt relatively competent to handle the implementation of the additional PE, still benefited from attending the course, both gaining new perspectives and knowledge. Teachers in general report that they gained new knowledge, partially due to the introduction to the ATC, but also through collaboration and knowledge exchange between teachers from different schools:

> *I was collaborating and learning with my colleagues...*
> *colleagues from my school but also from other schools that were*
> *part of the programme... And you got the Age-related Training*
> *Concept! So the concept was introduced in a theoretical way*
> *and we tried it out in practice, too... It changed my way of*
> *thinking and gave some new perspectives on how to prioritize*
> *when planning my lessons... it was really good... it was a*
> *fantastic course... [School 1 – teacher]*

The course was also meant to ensure that the PE teachers felt qualified to handle this additional amount of PE. Both heads and teachers perceived the course as enhancing the skills of the teachers and enabling the high-quality implementation of the additional PE lessons.

3.5 Perceived programme compatibility

All teachers and school heads stress that the non-elite focus of the programme was important as it fitted the existing values of the schools and the inclusion of all pupils regardless of their skill level. Also, both teachers and school heads state that although their school prioritized PE and PA prior to the initiation of the programme, their connection to the programme has boosted the prioritization of PE and PA and anchored it as a part of the school's set of values and everyday structure:

> *It [the Svendborgproject] has become grounded in our set of values... I would argue that if we suddenly no longer were part of the programme, some years would pass before... well I think it would be like "we are not a part of the programme anymore - no, but we are continuing this"... because it has become part of the way we think, it makes sense, it has become an embedded part of our school and of how to be a PE teacher at our school...*
> *[School 1 – head]*

School heads' interviews show that prioritizing PE initially received somewhat sceptical responses from non-PE teachers. There were different reasons for this. Prior to the programme, PE was often lumped with some of the smaller subjects like music and creativity. However, when the schools became part of the programme, pupils had as much PE as they had major subjects (e.g. Math and Danish) and it was prioritized financially. This investment in PE teachers resulted in a perceived shift as regards the status of the course. School heads and teachers state that many non-PE teachers initially were concerned that the participation in the programme could undermine their individual subjects. This was a concern represented across

all the six schools and, even though the added implementation of PE took the form of additional lessons added to the existing timetable and did not replace other subjects. Both school heads and teachers report that although non-PE teachers initially showed concern they did not do much protest against the programme when it was being implemented. This was mainly due to school heads being aware of the initial concerns, thus, they were careful not to under-prioritize other subjects and finding a balance favouring the whole school:

> *In my position, I had to represent the whole school... and how*
>
> *can this [the programme] fit into all aspects of our school?...*
>
> *Are we channelling too many resources into PE?... Are they*
>
> *[PE teachers] being prioritised financially? Are they the ones*
>
> *getting the bulk of qualification courses? So, we should focus*
>
> *on representing the whole school...* [School 4 – head]

Interviews with school heads show that the schools found various ways of prioritizing non-PE subjects while still upholding the programme requirements. In most cases this resulted in schools introducing cross-curricular lessons between PE and subjects like music (dancing and playing music) or biology (e.g. PA in nearby nature environments combined with learning about plants). Also, many of the schools had annual theme weeks (e.g. rehearsing and preparing a school play, or musical), and school heads report that these weeks were also used to encourage a special awareness of minor courses (e.g. music and creativity) that may have been felt to have been undervalued when the programme was initiated:

We have very talented arts teachers, and we have very talented

music teachers... Well, being part of this programme [the

Svendborgproject], such subjects will be a bit neglected....

However, now that we have those skills at the school, they

should be used... so, we have been able to combine movement

and music... we've taken one of our six PE lessons and simply

call it dance... so we dance and through that we combine music

and movement... [School 6 – head]

3.6 Perceived programme adaptability

All school heads and teachers recognize that, although they fulfil the same programme

requirements, all schools have their individual ways of being part of the programme. The high

compatibility of the programme is associated to the high degree of adaptability to the individual

school context. The opportunity to adapt the programme to individual school contexts was

inbuilt at the initiation of the project. Since schools were involved in the development of

programme content, they could ensure that differences in available facilities, school size,

surrounding areas (woods, lakes, urban areas etc.) as well as individual values and priorities

were incorporated.

I was part of the group focusing on how we should implement it

[the programme] at our school... there were much attention on

schools being allowed to adapt it to their individual culture...

so of course it was something new, but we focused on what it

would look like at our school... because the schools are very

different... [School 3 – Teacher]

This opportunity to modify the programme within the fairly simple programme requirements has also been highlighted by all school heads as a very important in aiding the implementation process and ensuring maintenance. This means that the implementation process has been operationalized through a combination of top-down decisions involving clear programme requirements and a bottom-up involvement on how to fit the programme into everyday school practice.

> *It is the balance between top-down and bottom-up... because it*
>
> *should not be top-down all the way. The framework is the top-*
>
> *down decision, whereas the content and the implementation of*
>
> *it is bottom-up... we were invited to develop the content... They*
>
> *[programme managers] were, like, there is a frame [the*
>
> *programme requirements] and that is not up for discussion.*
>
> *However, we would like to discuss how it could be implemented,*
>
> *how you want to do it at your school... how do you want to*
>
> *define the concept... [School 1 – head]*

4. Discussion

The aim of this study was to analyse provider and programme characteristics of SP with special focus on the experience of school heads and PE teachers during the adoption, implementation and maintenance process.

In summary, the findings showed that both PE teachers and school heads were willing to engage in the programme as it appeared to be a valuable asset to the education of pupils and fitted existing school values and priorities. Teachers and heads perceived benefits of the programme both as regards a general increase in the physical health of the pupils and in the perceived increase in skills and self-confidence of pupils whom teachers found insecure in relation to movement and sport. The implementation of the programme was highly dependent on dedicated attention given by PE teachers as well as school heads maintaining a balance in their prioritizing of PE and not neglecting non-PE subjects. Furthermore, PE teachers participated in a professional development course on age-related PE activities that resulted in new perspectives and teaching methods. These courses were also perceived as being supportive for teachers' dedication and implementation of the programme. Lastly, through its simple requirements the programme supplied a structural frame ensuring that schools knew what was expected of them. Yet, the programme also allowed schools to develop their own ways to fit the requirements to their individual school practice.

4.1 Provider characteristics

If providers find a programme relevant to local needs, this directly influences their ability to implement the programme to match expectations, and linking it to the existing values of a school further adds to the effective implementation of new programmes (Durlak & DuPre, 2008). In general, school heads and PE teachers showed commitment in the programme from the very outset, as to some degree it matched their existing values regarding PE and PA in school. School heads and PE teachers found the programme relevant due to its promotion of physical health, increased competence, social skills and the development of basic movement skills. These are outcomes that others have also associated with PE in school (Bailey, 2006).

The results of this study suggest, then, that additional PE in primary school can be used both to advance the skills and confidence of those pupils who are insecure in relation to movement and sports and also to promote pupils' general physical health (Klakk, et al., 2014; Klakk, et al., 2013). The advancements in skill and confidence of insecure pupils were a result of implementing increased amounts of PE, which allowed teachers to pursue PE activities and individual sports in greater depth.

There is general consensus that investing in the skill development of providers is vital to facilitate the capacity for change (Durlak & DuPre, 2008; Ogden & Fixsen, 2014; Schuler, Saksvig, Nduka, Beckerman, et al., 2018). In the present study, the provision of training for PE teachers ensured both their dedication and an increased level of skill, even in teachers who perceived themselves to be relatively competent at implementing the programme. However, despite their skill level, providers can also become a barrier to implementation as a consequence of their competing work assignments and their lack in dedication to the programme (McIsaac, Read, Veugelers, & Kirk, 2017; Schuler, et al., 2018). In the present study, those teachers who did not have PE as a subject were a potential barrier when the programme was initiated, as they initially raised concerns that their individual subjects might be undermined due to the added focus on PE. However, the decision to add the extra PE as an addition to the existing timetable and to affect other subjects, and the school heads' determination to find a balance that favoured the whole school helped ease these the concerns from non-PE teachers. School heads also indicated that the political backing of the programme sent a clear message supporting the decision of the school to be part of SP. This kind of political support through municipal strategies and allocation of resources has the ability to aid school heads and dedicated teachers in overcoming resistance to implementation (McIsaac, Read, Veugelers, & Kirk, 2017; McKay, Macdonald, Nettlefold, Masse, et al., 2015). Lastly, it is

important to emphasise that adding the PE lessons to the existing timetable also resulted in PE teachers feeling that they were being given time to teach the programme and to fulfil its requirements rather that perceiving those requirements as competing with existing work assignments.

The findings of this study reveal that the implementation and maintenance of the programme has been realised through a collaboration between school heads and PE teachers. Former studies have identified effective leadership and school head commitment as being influential on implementation efforts (Durlak & DuPre, 2008; Forman, et al., 2008; Maria Ingemarson, Bodin, Rubenson, & Guldbrandsson, 2016; Payne, 2009). The results of this study and of others also argue that programme implementation can benefit from having at least one programme promoter acting as an ambassador and encouraging the programme at the school (Durlak & DuPre, 2008; Forman, et al., 2008). Interviews show that both school heads and programme promoters have acted as local ambassadors. School heads emphasise the importance of having teachers backing the programme and especially of having a programme promoter with a key role throughout the entire process from initiation to maintenance. However, the results of this study suggest that this has been interdependent teamwork, as neither school heads nor teachers could implement and maintain the programme without the other. This interdependence resulted in school heads needing staff to back their decisions and drive the implementation process, while dedicated PE teachers and programme promoters needed heads to support their ideas as teachers can be reluctant to be subordinated by their peers (Forman, et al., 2008; M. Ingemarson, Rubenson, Bodin, & Guldbrandsson, 2014).

Maintenance is one of the less developed aspects of implementation (Ament, Gillissen, Moser, Maessen, et al., 2017; Ogden & Fixsen, 2014; Rimehaug, 2014). SP has proved to have been maintained in a school settings for ten years. Both school heads and

teachers report that the quarterly collaboration meetings between programme managers and school representatives from all participating schools have been an important influence in this maintenance. Through these collaboration meetings, schools were encouraged to devote continual attention to the programme and were reminded of the requirements it entailed. Griffin et al. found that being reminded that they were part of a programme was desired by teachers in helping to transform programmes into long-term change (Griffin, et al., 2015). However, it is important to emphasise that the collaboration between programme managers and schools was a mix of top-down and bottom-up, where the schools' experiences, knowledge and ideas on how to advance and maintain the programme also played their part. This combination of top-down decisions and bottom-up involvement is related to successful implementation, as those involved in such collaborations will increase the opportunity to share and learn from the experiences of others and enhance the sense of being part of the programme (Ogden & Fixsen, 2014; Sulz, Gibbons, Naylor, & Higginsb, 2016).

4.2 Programme characteristics

New programmes introduced to the school setting often raise concerns at the teacher level due to the additional work-load involved and the time required for implementation (Adamowitsch, Gugglberger, & Dur, 2017; Naylor, et al., 2015; Pearson, Chilton, Wyatt, Abraham, et al., 2015; Schuler, et al., 2018). Teachers are also shown to be concerned that they have to reduce their focus on academic goals in order to meet the requirements of new programmes (Keshavarz, Nutbeam, Rowling, & Khavarpour, 2010; Lytle, Ward, Nader, Pedersen, et al., 2003). Clarke et al. found that this attention on academic achievements often results in lower priority being given to PA at schools (Clarke, et al., 2013). The results of the present study show that PE teachers did not share these concerns, as the programme fitted the existing school priorities

regarding PA and PE and actually resulted in teachers getting more time to teach PE. Additionally, Bugge et al. found that being part of SP had no negative effects on the academic abilities of pupils (Bugge, Moller, Tarp, Hillman, et al., 2017). This indicates that time allocated to incorporate additional PE into the daily schedule can serve as a successful promotion of PA without schools having to make a trade-off between promotion of PA and upholding academic standards. However, in order to achieve successful implementation, it is still important to provide additional training of programme providers (Durlak & DuPre, 2008; Naylor, et al., 2015). In SP, the professional development course provided PE teachers with new ideas, perspectives and inspiration for practical exercises and allowed them to exchange knowledge with teachers from different schools, eventually enabling high-quality implementation of the additional PE lessons.

The results of this study show that schools' involvement in the initial planning of SP helped ensure the potential fit of the programme to existing school values and priorities. This matching of the programme to individual school context was highlighted both by school heads and by teachers as an important factor in ensuring commitment, and this has also been highlighted by others as important in ensuring implementation and maintenance (Durlak & DuPre, 2008; Forman, et al., 2008; Naylor, et al., 2015; Pearson, et al., 2015). Due to the fairly simple programme requirements (adding three times the amount of PE, assigning a programme promoter at the school and having PE teachers attend a professional development course), schools were provided with a clear framework in which they were allowed to continue the local adaptation of the programme. This was an important aspect of the programme, as schools had different sizes, facilities and focus areas (nature, music, arts etc.) and it illustrates the point made by Kok et al. that, when implementing programmes in a real-world setting, the realized

practices will become deeply embedded in the local context (Kok, Vaandrager, Bal, & Schuit, 2012).

4.3 Strengths and limitations

A strength of this study is the focus on the provider perspective of the implementation processes and the contextual descriptions of a successful school-based programme tripling the amount of PE. Together with the simple programme requirements of SP, this focus potentially increases the external validity of the study. However, we also recognize that this study has limitations. Initially, we would like to point out that all PE teachers and school heads report that they found the programme relevant and in alignment with their individual school's values and priorities. Also, all the schools chose to become part of the SP from the outset, and this could explain why the respondents had an overall positive attitude towards the programme. This could challenge the possible transferability of the programme to schools not having a grounded interest in PA and PE

Teachers who had acted as programme promoters across the six schools were primary sought as informants. This was due to their in-depth understanding of the programme and broad insight of the implementation process at their individual school. Promoters, however, also acted as ambassadors for SP and could display a general positive attitude towards the characteristics of the programme. Four of the six teacher respondents in the current study were former or current programme promoters and the study would possibly have benefited from including more PE teachers not affiliated with the role as programme promoter, or even non-PE teachers from other subjects. Such perspectives from non-promoters could have contributed to a more nuanced view of the implementation process. Furthermore, the study does not include attention to the teachers and schools who initially decided not to participate in the programme.

Although the rest of the schools in the municipality chose to become part of SP when they were given the opportunity three years after initiation, it would have been relevant to explore why they initially chose not to participate. Exploring factors influencing schools' initial decision to participate could aid the establishing of better strategies when introducing future programmes to schools and teachers.

Also, some of these processes date back ten years and it might have been profitable to follow providers' implementation process from programme initiation in 2008. This retrospective position mean that we cannot eliminate the possibility that interviews could contain some recall bias. We recognise that the results could have been more nuanced if data had been gathered during the early implementation process before the programme had become a success and before it formed an integrated part of the school. However, we would also like to emphasise that SP has been successfully implemented and maintained for 10 years and has proved to be effective in relation to various outcomes. Performing this study provides a unique insight into a school-based programme introducing more PE in primary school, and SP presents itself as ideal for the exploration of providers' ability to adopt, implement and maintain the programme.

4.4 Lessons learned

Firstly, an important lesson learned from this study is that the possibility to fit a programme to individual school values is an important factor to secure willingness to adopt a programme. The results indicated that school-based programmes especially can benefit from schools not having to make a trade-off between promotion of PA or PE and upholding academic standards. Results indicate that this can be done by allocating time to incorporate additional PE into the daily

schedule. In SP, this was realized by adding the programme as an addition to the existing timetable.

Second lesson learned is that programmes benefit from being flexible for adaptations to local needs. However, simple requirements are important as they deliver a frame in which programme providers can identify what it implies to be part of the programme and which elements are undiscussable and must be implemented. Such a double-faced approach can support the realisation of effective programmes in specific contextual circumstances.

Third lesson learned is that quarterly meetings between programme promoters and programme managers can support maintenance by providing continual attention to the participation in a programme and remind involved schools of the entailed requirements. Combined with a bottom-up oriented approach such collaboration meetings can also support maintenance by increasing the opportunity to share and learn from the experiences of other implementation sites in the programme and enhance the sense of being part of a programme.

Fourth lesson learned is that a professional development course will possibly support PE teachers' dedication to implementing a programme containing more PE and increase their skill level. Participation in a course can also secure that PE teachers perceive themselves competent to increase the amount and quality of their PE lessons. Such courses can benefit from having practical exercises that directly can be applied in the PE lessons. Also, having PE teachers from different school participate together can contribute to exchange of knowledge and ideas regarding the implementation of additional PE.

5. Conclusion

This study presents a valuable insight into PE teachers and school heads motives for adoption, implementation three times the amount af PE and maintaining this for a period of ten years.

This has been realized through dedicated PE teachers and school heads, who found the additional PE to be a valuable asset that could benefit the pupils and fit their school's existing values and priorities. Teachers in particular find that pupils increase their movement skills and that there is increased self-confidence in pupils who are insecure in relation to movement and sports. Furthermore, PE teachers participated in a professional development course that resulted in new perspectives and teaching methods, which both aided their dedication to the programme and their implementation of it and increased their skill level. Lastly, simple programme requirements provided a structural framework, which ensured that schools knew what was expected of them and the degree to which they could adapt the programme to their individual school practice and priorities.

Competing interests

The authors declare that they have no competing interests

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Tables:

Provider characteristics	Description
Perceived need for programme	Extent to which the proposed programme was relevant to local needs
Perceived benefits of programme	Extent to which the programme has achieved relevant impact at the local level
Perceived ability to do what is expected	Extent to which providers feel they were able to deliver as expected in the programme setup
Skill proficiency	Extend to which providers possessed the skills necessary for implementation

Characteristics of the programme	
Compatibility	Extent to which the programme fits school priorities and values.
Adaptability	Extent to which the proposed programme can be modified to fit provider preferences, school practices and cultural norms

Table 1: Description of provider and programme characteristics based on Durlak and DuPre (Durlak & DuPre, 2008)

Appendix A - The professional development course:

The physical education teachers participated in a professional development course based on an Age-Related Training concept (ATC). ATC is developed by Team Denmark (the Danish Elite Sport Foundation) who had published a description of ATC that were handed out to participants (in some cases an electronic version) (Bach & Eiberg, 2010; Pryce, Willeberg, Falkentoft, & Meyhoff, 2005). The Age-Related Training concept stresses the importance of training children in a biologically relevant manner to accord with their physical and physiological maturity. Moreover, the course also had a focus on how to arrange outdoor physical education, which was deemed a practical necessity in coping with the extensive pressure on facilities when implementing triple the amount of PE.

Another aim of having PE teachers to participate in the professional development course were to uphold the general quality of the additional PE lessons. Besides the introduction of ATC this was supported through a partial focused on how to arrange outdoor PE, as this was deemed a practical necessity in coping with the extensive pressure on facilities when implementing triple the amount of PE lessons. The course was ultimately to help teachers feel qualified and to provide input on how to handle the additional levels of PE. In relation, all schools arranged some of the PE courses as outdoor PE despite season or weather conditions (Nielsen, Skovgaard, Bredahl, Bugge, et al., 2018).

The professional development course was developed through a collaboration between the municipality of Svendborg, University College Lillebaelt (the institution educating teachers) and Team Denmark. The educators of the professional development courses were mainly educators from University College Lillebaelt.

The initial course setting worked as a pilot-project meant to adjust the course. Through the pilot-project possible theory and exercises were tried out and participants were given group assignments to reflection on how the programme could be implemented on their school. PE teachers (mainly the ones chosen as programme promoters) and pedagogic personnel across all schools in the programme participated. This pilot-project ran from late-2008 to mid-2009 and contained 40 hours (divided across four modules). In mid-2009 the

professional development course was completed and available for all PE teachers and pedagogic personnel that had not already participated in the pilot-project. The professional development course consisted of four-modules divided over eight months.

The professional development course consisted of different practical themes like how to teach ATC outdoor or in relation to ball games. The professional development course for PE teachers were held at either one of the local schools that were part of the programme or University College Lillebaelt (located in the municipality of Svendborg). School heads were the ones deciding when the teachers could attend the course and the course was held was placed after the teachers normal working hours.

Appendix B

This appendix contains a sample of interview questions across the provider and programme characteristics.

The full interview-guide as well as interview-guides for school heads, will be sent on request by contacting the first author.

Provider characteristics	Description	Interview Question
Perceived need for programme	Extent to which the proposed programme was relevant to local needs	— What was your initially attitude towards the programme? — Did you have any possible benefits in mind when the programme was initiated? — To what degree did you find the programme relevant? — To what degree did you fell committed to the programme?
Perceived benefits of programme	Extent to which the programme has achieve benefits desired at the local level	— Did the programme achieve the expected benefits? — How did your attitude towards the programme and its benefits change during the implementation process?
Perceived ability to do what is expected	Extent to which providers felt they were able to do what is expected	— Did you experience that you had the necessary time and resources needed to implement the programme?

Category	Description	Questions
Skill proficiency	Possession of the skills necessary for implementation	— Did you feel professionally equipped to become part of the programme? — Did you possess the necessary tools to perform the implementation of the programme?
Characteristics of the programme		
Compatibility	Extent to which the programme fits school priorities and values.	— How would you describe your involvement in the programme? — Which of the programme characteristics would you consider has had the most impact on your daily work? — Do you consider the programme as an integrated part of your everyday practice
Adaptability	The extent to which the proposed programme can be modified to fit provider preferences, school practices and cultural norms	— Have you made any changes to the programme on your school? — Do you apply the programme in the same way as when you implemented initiated it? — Do you feel that you have had influence regarding how the programme should be implementation on your school?

Appendix C

This appendix contains examples of selected citations from the qualitative material. Citations are presented across the provider and programme characteristics, as these were the dimensions the qualitative data were informing on (see table 1 in the manuscript). All citations have been identified through the coding process (see section "Qualitative data analysis").

Provider characteristics	Teacher	Heads
Perceived need for programme	… the benefits were also that it was for everyone… because we were facing some challenges, some children became heavier and there were some children who had poor motor skills and we had some difficulties… we saw that this might be an extra effort to counteract that… [School 1 - teacher]	And at least it was my perception that it helped to provide a good knowledge of the different schools and good cooperation between physical education teachers and the municipal school area, so it was a really good programme for developing that… but also a programme that brought cohesion in the new municipality… [School 4 – head]
Extent to which the proposed programme was relevant to local needs		Well, I believe that a child's first communication is through their body… so, it is very important that they know how to interact with each other physically… if you are not able to kick a ball or are in the way all the time, then you are put on the bench and getting marginalized already from a young age… I think it means the world that they learn how to use their bodies, and enjoy using them in play with others… the social development of children, it is increased, I am sure of it… [School 3 – head]

Perceived benefits of programme		
Extent to which the programme has achieve benefits desired at the local level	In physical education lessons there is some social education build into it… because when you are playing a game or doing exercises the pupils need to learn to be quiet when new instructions are given and so on… but especially in relation to the social aspect… when playing the game, they have to respect the rules of the game but also respect each other, otherwise the game will collapse… and now we have gotten the opportunity to focus even more on this because we have more physical education lessons… [School 3 – Teacher]	Some children… the children we see that benefits the most of it… they are into it… because when you are playing a game or the ones who really struggled to commit themselves physically, they are the ones who really getting something out of this. Those who perform well sportingly, they would have done that anyway. They do not get any extra out of it. That's how I experience it. The joy of using their body… [School 3 – head]
	I think those who benefit from this [the school being part of the programme] are the children who feel very insecure regarding movement, touching a ball or using the facilities in the gym… and by having to do it several times a week, they become so much more skilled, they are actually making progress from being at a very low skill-level and are clearly getting better and more confident… I do not think that the children that are already good at sports are become significantly better… but the insecure, they greatly benefit from the school being part of SP [School 6 – Teacher]	The physical education teachers expanded their professionalism… and we definitely did not get poorer physical education of this [participating in SP], I am absolutely sure of that… there has been a huge progression, some of the teachers who have been involved for many years, they have gained so very much from this [School 1 - head]
Perceived ability to do	It also demanded that management is backing my work as promoter, because they are still my colleagues… I only have the function of coordinating these things, but still it is very important to	I would promote the need for external decision-making… decisions from someone not part of the individual school culture… Because it really has been an important aspect in this programme… if we were told to develop

what is expected	have someone at the schools who have this promoter perspective, it is important to the programme to have someone who are prioritizing it... but you also need the backing of management to be able to do so [School 1 - teacher]	this kind of concept and we had to figure it out ourselves... then we would never have come this far... this programme is just unique because there is a frame, there is some external control that ensures that we, as a school is able to say that is how it is, now how do we act on it [School 1 – head]
Extent to which providers felt they were able to do what is expected	I also think it has been productive that to have these non-negotiable elements from the beginning... that there are something specific to hold on to... in the long run you might find that things become more mixed, but I think it is important to have a solid structure to start with ... [School 3]	The thing that aids me as a school head is the strong political dedication to the programme... when politicians in [Anonymised municipality] prioritized this and said that they wanted to promote it in all schools in the whole municipality, that they would give a big bag of money to support the schools... they were talking a lot about the programme, they made conferences and such things... it helps making the programme happen as it also sweeps resistance [School 6 – head] You need some physical education teachers who finds value in the programme... who are dedicated and can see the possibilities of it ... If I were to listen to physical education teachers each day saying 'it is awful that we have these six hours of physical education - The kids are tired and we cannot make it work'... Well, that would be something else, but the physical education teachers love it! the vast majority of the children are fond of having physical education... But the teachers' involvement is the most important... [School 4 – head]

Characteristics of the programme		
Skill proficiency Possession of the skills necessary for implementation	*I was collaborating and learning with my colleagues… colleagues from my school but also from other schools that was part of the programme… And you got the Age-related Training Concept! So, the concept was introduced theoretical and we tried it out in practice too… It changed my way of thinking and gave some new perspectives on how to prioritize when planning my lessons… it was really good… it was a fantastic course… [School 1 – teacher]*	*The course and the Age-related Training Concept, it boosted… people came back from these courses and were very lifted and positive… typically the courses were from 4pm to 8pm, and they [teachers] had been at work all day… But nevertheless, I witnessed that they had been learning, they had gained something that they immediately could put to use… They, had become part of the product they were supposed to deliver…And that gave a lot to how we did things at our school… [School 4 – head]*
Compatibility Extent to which the programme fits school priorities and values.	*I think there was a big commitment to it, which was also due to the fact that we had chosen this ourselves [to become part of the programme]… no one had said "here you are, now you HAVE to do this" it was more like "do you think this is an interesting programme and would you like to be part of it"… and that is a really nice approach … [School 6 – Teacher]*	*It [SP] has become grounded in our set of values… I would argue that if we suddenly no longer were part of the programme, some years would pass before… well I think it would be like "we are not a part of the programme anymore - no, but we are continuing this"… because it has become part of the way we think, it makes sense, it has become an embedded part of our school and how to be a physical education teacher at our school… [School 1 – head]* *In my position, I had to represent the whole school… and how can this [the programme] fit into all aspects of our school?… are we channelling too many resources into physical education… are they [physical education teachers] the ones getting all the financial prioritization? Are they the ones*

	who get a lot of qualification courses? So, we should focus on representing the whole school... [School 4 – head] We have very talented arts teachers, and we have very talented music teachers... Well, being part of this programme [SP], such subjects will be neglect a bit... However, now that we have those skills at the school, they should be used... so, we have been able to combine movement and music... we've taken one of our six physical education lessons and simply call it dance... so we dance and through that we combine music and movement... [School 6 – head]	
Adaptability The extent to which the proposed programme can be modified to fit provider preferences, school practices and cultural norms	I was part of the group focusing on how we should implement it [the programme] at our school... there were much attention on schools being allowed to adapt it to their individual culture... so of course it was something new, but we focused on what it would look like at our school... because the schools are very different... [School 3 – Teacher] Of course, there is an overall frame, the six hours and 20 minutes of high intensity etc... However, it is very different... there is a very high degree of variation between the schools on how they have organized it, how they apply it... We actually had, in the beginning, we had workshops, and we came to inspire each other and listen to	It is the balance between top-down and bottom-up... because it must not be top-down all the way; the frame is the top-down decision, whereas the content and the implementation of it is bottom-up... we were invited to develop the content... They [programme managers] were like; there is a frame [programme requirements] and we do not want to discuss it, however, we would like to discuss how it could be implemented, how you want to do it at your school... how do you want to define the concept... [School 1 – head]

how the different schools had put it into practice… and already then there was such a big difference in how we had done it …

[School 1 - teacher]